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OF

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ON THE HISTORY OF PHYSICAL GEOGRAPHY.

I have made the subject of my annual address this year the History of Physical Geography. I have selected this subject because it is one that, so far as I know, has not yet been generally inquired into, and because the information that is requisite to a knowledge of it is not to be found in the ordinary works of reference or encyclopædias, but has to be gathered from many sources and over a wide field of inquiry. Before entering upon its history it will be, perhaps, appropriate that I should first state what the Science of Physical Geography is.

Alexander Von Humboldt in his last and greatest work, "Cosmos," divides the subject of which he treats into two parts: 1st, the physical system of the Universe, and 2d, the physical system of the Earth, the latter being, in a general way, what is now understood by the Science of Physical Geography.

It embraces the form and movements of the earth, the

configuration of its surface, the aerial covering or atmosphere that surrounds it, the relative distribution of land and water, the currents of the air and of the sea; the distribution of heat, the magnetic influence that affects the earth, and many other details of a physical nature relating to it, which were formerly embraced under the general head of Geography, but which are now taken from it and arranged into a distinct and separate science.*

Humboldt's idea of science is mind applied to nature. "Science," he says, "begins for man the moment that his mind lays hold of matter, and he endeavors to subject the mass of material that has accumulated into rational combinations."

This is Sir John Herschel's idea of the Science of Physical Geography. "It takes," he says, "the heap of particulars that is stored up by descriptive geography, to present them as a harmonious whole, by showing that they are all bound up together by mutual relations or inter-agencies and are all subordinate to a great scheme of providential arrangement."†

The history of this science is a history of how man acquired his knowledge of the true nature of the earth and of the physical laws or phenomena connected with it. It is a history that naturally begins with the first impressions that he had of the earth and its phenomena, which

*Humboldt included in it the geographical distribution of plants and animals, but W. E. Cooley in his recent treatise omits this as more appropriately belonging to the sciences of Botany and Zoology. (*Cooley's Physical Geography, Preface vii.* London, 1876.)

†Cooley defines it more strictly as that department of science which embraces the course of physics reigning on the earth's surface, over land, sea and air, and of which, as it depends to some extent on the features of that surface, Geography is a function. (*Cooley's Physical Geography, Preface.*)

carries us back to a very primitive age, and suggests at the outset what knowledge we can possibly have of man's impressions respecting the earth, at a period so remote.

Niebuhr says, in his Historical Lectures, that if we exclude the history of the earth and confine ourselves to the history of mankind, we can go back only to those times, the traditions of which have come down to us, as the history of nations and of periods, before the discovery of the art of writing, is buried in impenetrable darkness. At the time, he says, when our traditions begin, we find the earth inhabited by a number of different races, distinguished from each other by their manners and their customs, as they are now, and that the further we go back the more we find that the languages were distinct and the nations foreign to each other; and he concludes with the remark that whether these nations were originally of different origin, or whether their original identity was gradually changed in form and in language, we cannot arrive at any certain knowledge without a distinct revelation from God, and that upon these points the Book of Genesis cannot be considered as a revelation.

It is now about sixty years since these words were uttered by one of the most acute and learned historical critics that ever lived, and yet within that comparatively short time prodigious strides have been made towards a knowledge of that period, which to Niebuhr was one of impenetrable darkness.

The studies in comparative philology, or to speak more plainly, of different languages, have disclosed that many nations, that for centuries have been separately

distributed over the globe and apparently wholly distinct from each other, are in fact connected together by the common tie of language, and are all descended from a single stock or people who spoke one tongue.

The discoveries that have since been made in Egypt, the oldest civilization so far as our present knowledge extends, as well as upon the sites of the Chaldean, Babylonian, Assyrian, Arabian and other ancient civilizations, such as temples, tombs, dwellings, inscriptions, engraved gems, cylindrical tablets, records and documents in clay, works of art and pictorial representations of customs, amusements and domestic life, as well as of the industrial arts, which have been brought together and studied under what has now become a new science, that of comparative archaeology, have shed a flood of light on ancient civilizations that were wholly unknown half a century ago, and another science, that of comparative mythology, has revealed man's beliefs respecting the earth and many other things, up to a very primitive period.

Not only has all this been acquired, but within the same time researches have been carried on and discoveries made in respect to primitive man that disclose very plainly what was his original state in every part of the globe.

There was formerly a widespread and persistent belief which, as I shall presently show, was of Egyptian origin, that there was once what was called "A Golden Age;" in which everything that was necessary to man's existence was produced without his instrumentality; an age of innocence and of happiness, of abundance without toil, of ideal justice, of peace and equality, during

which a perpetual Spring made the earth an abode of delight.*

This belief had a great fascination for the classic poets, and as its long continuance shows, for mankind generally; for it was pleasant to think of a time when there was no evil, but everything was virtuous and good.

The labors of the ethnologist and the anthropologist, however, prove that there never was such an age. Their researches and discoveries show that so far as the remains of man, or of anything pertaining to him have been found, his early condition was everywhere the same, that his first state was one in which he depended for subsistence upon fishing, the chase, and the wild fruits of the earth; the state of a hunter or fisher, as appears in the fact that in the earliest deposits in which his remains have been discovered, the rude implements of bone or of stone, with which he fished, hunted or killed the wild animals upon which he subsisted, are found with him; a condition that has not yet entirely passed away, but one in which he is still found, in Australia and in other parts of the earth.

His next and more advanced stage was, in those countries where the climate allowed it, that of the possessor of flocks and herds, moving about from place to place as pasture was afforded, a state still existing, and to a considerable extent, in certain parts of Asia: and the next was when he settled down in fixed abodes as an agriculturist; when men congregating together began the building of towns, the founding of cities and the formation of nations.

* La Rousse, *Le Grand Dictionnaire Universel du XIX Siècle*, ART. *Âges.*

That, before this, man lived everywhere in what has been called a stone age, is attested by the fact that on the sites of the most ancient civilizations his rude stone implements have been found, such as stone axes, spear-heads, flint arrow-heads, etc. In Egypt, along the banks of the Nile, and for a considerable distance over Northern Africa, these rude stone implements have been discovered, attesting that before this early civilization began the men who used these rude implements dwelt there.

What is especially striking in the recent researches of the ethnologists, is the wide distribution of these remains throughout the earth, and the great length of time that man must have been an inhabitant upon it. "In every part of the globe," says the Marquis de Nadaillac, one of the most recent investigators of the subject, "in all latitudes, under all climates, the chipped flints (*les silex*), whether they are simply cut, or polished by persevering labor, present an analogy which strikes the most superficial observer."*

This early distribution of savage man all over the globe is the more remarkable when it is considered that the early stages of civilization were not favorable to the growth of geographical knowledge. When men who had formerly wandered about as hunters and fishers settled down to the cultivation of the earth as a more certain means of subsistence, what they wanted was to be let alone. They had no desire to know anything of the countries and the people about them, and what they desired more especially was that nothing should be

* *Moeurs et Monuments des Peuples Préhistoriques*, par le Marquis de Nadaillac, Paris, 1880.

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known about them, as these outside wandering and warlike tribes, that were ever in quest of food, might suddenly descend upon them and sweep away all the fruits of their industry. In fact, this goes on at the present day in certain parts of north-eastern Asia, where the hill tribes, in seasons when game or other means of subsistence is scarce, come down upon the peaceful agricultural dwellers of the plains and carry off their cattle and everything that they have stored up as food. Even the Indians in our own country, when they have settled down as agriculturists upon the lands allotted to them by the government, have a hard struggle ; not from the inroads of warlike tribes in their vicinity, but from the friendly nomads, who, in the winter, when food is scarce, frequently come and claim the right of hospitality in such numbers that everything that the settled Indians have laid up for themselves is consumed. In fact, what man wanted in the earliest stages of civilization was isolation and security, and when we consider this we may form some conception of how difficult was the growth and development of early civilizations.

During the last half century the question has also been extensively discussed, whether man, in all the varieties in which we find him now, is the product of a single race, or whether there was originally a diversity of races. The difficulty in this question is, that men have now become so intermixed by the intercommunication that has been going on for a great length of time, that the traces of an original distinction, if it ever existed, must now be nearly obliterated, and all, I think, that can be said respecting this investigation is, that nothing has been absolutely proved.

Another marked feature in this general inquiry, has been the rise during the last thirty years, or perhaps I should say the revival, of what has been called the theory of Evolution, and, as growing out of it, the inquiry known as the Origin of Species, and the Descent of Man, commonly called Darwinism.

As the science of geology has proved that the order in which plants and animals have appeared upon the earth has been from simple to more complex organizations, or, as the geological divisions show, the law of progress is from lower to higher forms, a fact which I apprehend is now generally accepted, Darwin and his followers have undertaken to show that the way in which this takes place is that there is a tendency in all species, whether of plants or animals, to branch off into varieties, most of which perish, while some survive, to transmit their peculiar differences or varieties to their offspring, so that a new species is thereby created, which in time becomes permanent; and that this has been going on for long periods of time, and will account for all the varieties that now exist, whether in plants, animals, or in the human species. There is, these writers say, constantly going on a struggle for existence, in which the capable survive and the weaker perish; which Darwin expresses by the term "natural selection," and Herbert Spencer calls "the survival of the fittest." And that this has gone on until it has culminated in man, the highest and most perfect of organisms.

I simply state what this theory is as I understand it, without undertaking to discuss it. In such an inquiry as I am making into the early history of man, his relations to the physical phenomena by which he was sur-

rounded, and his early impressions respecting it, I could not well pass over an investigation to which so many scientific men have given their attention, and which has been so earnestly discussed by those who believe in it and by those who do not.

It is sufficient to say that this theory stops with the assumption that all plants and animals came from primordial germs. It does not undertake to explain how these primordial germs came into existence, or how, or why the liquid substance, that is found in the cells of the lowest organisms, is endowed with motion and is the source of life; so that life, except as a direct act of the Creator, is as much a mystery as ever, a result warranting the remark of Dr. Scoffern that while Science removes mysteries, it, in doing so, opens up other mysteries.

This theory, I should further state, ignores a spiritual nature in man. At least Darwin had no belief in it, believing only in the natural operation of forces, although W. R. Wallace, the co-originator of the theory, as I gather from a recent notice of his last work, does believe in it, and seeks to harmonize it with his theory.

Edmund Burke pithily said that man was a "religious animal," and certainly all knowledge of him in the past warants the general conclusion that some form of religious belief is a necessary aliment of his nature, and that he will be slow to accept any theory in respect to his origin, or his nature, that does not admit this.

There is another matter in which our knowledge has been greatly enlarged since the time of Niebuhr: it is in respect to the earth itself. For this we are indebted

to the geologists, and I cannot give it more appropriately than in the recent language of one of our most eminent American geologists, Professor Joseph Le Conte. "There was a time," says Professor Le Conte, "not many decades ago, when all things, the origin of which transcends our ordinary experience, were supposed to have originated suddenly and without natural process; there was a time when mountains were supposed to have been made at once, with all their wonderful diversified forms, their beetling cliffs, their thundering waterfalls, their gentle slopes and smiling valleys, as we find them. But now we know that they have become so only through a very gradual process, and that they are still changing. There was a time when continents and seas, gulfs, bays and rivers, were supposed to have originated at once, substantially as we see them. Now we know that they have been changing through all geological time, and are still changing. There was a time when rocks and soils were supposed to have been always rocks and soils—when soils were regarded as an original clothing, made on purpose to hide the nakedness of the new-born earth. Now we know that rocks rot down to soils, that soils are carried down and deposited as sediments and that sediments are consolidated into rocks; the same materials being worked over and over again, passing through all these stages many times in the history of the earth; for there was a time when it was thought that the earth, with substantially its present form, configuration and climate, was made at once, out of hand, as a fit habitation for man and animals. Now we know that it has been changing, preparing, becoming what it is, by a slow pro-

cess, through a lapse of time so vast, that the mind sinks exhausted in the attempt to grasp it."

This suggestion, of the great changes that the earth has undergone, brings us to the period when its surface was brought into a condition more nearly resembling what it is now, and which is the one where the science of geology may be said generally to end, and that of physical geography to begin. This is the time of the deluge, the Chaldean record of which is found in the Book of Genesis. Over various parts of the globe traditions exist of a deluge. Catlin states that among 120 tribes of Indians that he visited in North and South America, there was not a tribe that did not have a tradition of a deluge. Xenophon mentions five deluges during certain supposed periods, and the order of succession in which they occurred, the fourth of which was called by the Greeks the Deucalion Deluge, which was believed to have continued for three months.* The Chinese have a record of a great inundation 2300 B. C., which overflowed the principal rivers of China.† And among the Assyrian discoveries of George Smith was a tablet or clay memorial containing a detailed account of a deluge substantially the same as the one narrated in Genesis.‡

But the occurrence of a great physical event of this kind does not depend alone upon these traditions. A geological examination of that large part of Russia known as the Steppes, shows from the configuration of the surface and the marine deposits throughout it, that the whole of this great area was once the bottom of a

* *L'Océan Ancien*, p. 41. † *Catlin's Letters*, vol. 1., p. 181. ‡ *Howorth, The Mammoth and the Deluge*, p. 446.

shallow sea, which, in the opinion of the traveller Tournefort, extended as far as the northern part of the Caucasus and there formed two vast gulfs, one of which was the Caspian Sea and the other the Euxine or Black Sea. Moreau de Jonnes, in a work "L'Océan Ancien," an author of extensive learning and great acuteness, maintains that this is the ocean of Homer, who did not, he insists, refer to the Atlantic, which, in Homer's time, was unknown beyond the Straits of Gibraltar. This author, de Jonnes, in view of the marine deposits that are spread over the whole of this region of the steppes, and other facts, such as that certain portions of the northern coasts of Europe are now rising, thinks that the comparatively flat bed of this ancient ocean was gradually raised, until it reached a certain point of elevation, when the whole of its vast sheet of water, extending from the mountains of Thrace to the Caucasus, was precipitated upon the plains of northern Asia, in an inundation so sudden and so widespread, that it swept everything before it, involving an enormous destruction of animals and human life; and that this great physical event left that part of northern Asia, which had theretofore supplied these animals with food, the sterile waste that it is now, and greatly changed the configuration of the surface of Asia, from the Sea of Aral to the Straits of the Bosphorus.

Mr. H. H. Howorth, in a very recent work, *The Mammoth and the Flood*, has brought together not only the many legends of different people in various parts of the earth, but a great array of facts from the explorations of travellers and the labors of archæologists and palæontologists, which, to quote his words, "Points unmistakably

to a widespread catastrophe, involving a flood upon a great scale." He shows that, before this event, the climate of northern Siberia was temperate and equable, where the mammoth existed in such prodigious numbers that the traffic in the ivory left by its remains has now been going on for more than a century; and that these animals perished by some great catastrophe operating simultaneously over a wide area is proved, he thinks, because the condition in which their remains are discovered does not indicate an ordinary death, as they are tumbled, tossed, and heaped up together in large mounds, frequently upon the tops of hills, showing that the catastrophe in which they perished was such as would be produced by the onward movement of tumultuous waters in some great inundation or flood.*

The Duke of Argyll, with that careful consideration that marks the investigations of this distinguished man, thinks it highly probable that in comparatively recent times great changes occurred, altering the earth's surface over a large part of Europe, and with a rapidity that caused a great destruction of animal life†; and facts gathered by American investigators indicate a like state of things and from a like cause in North America.

But it is to the period of the great Asiatic Deluge and what followed it that my inquiries more particularly relate, for although the earliest remains of man have been found in America, it was in Asia, so far as the present state of our knowledge indicates, that the earliest civilizations began; that of Egypt in the valley of the Nile, and those of Chaldea, Babylonia and Assyria in the valleys of

* Howorth, *op. cit.* ch. xi.

† Address before the Edinburgh Geological Soc. in 1883.

the Euphrates and Tigris; and it is the conception, which the men who founded these civilizations and their successors had of the physical phenomena by which they were surrounded, to which my inquiry is especially directed.

That these early civilizations began with, and grew out of the pastoral state, appears in their religion and their most ancient symbols. Their earliest worship was associated with the animals that belong to that state, such as the bull, the cow, and domestic animals generally. The ox was adored at Memphis, the ram at Thebes. The crook of the shepherd and the barb of the cowherd were the royal emblems or symbols of the Pharaohs, and the horn of the bull encircles the mitre of the Assyrian kings.* What the ideas of these early civilizations were of the earth and of physical forces generally, we have two means of knowing; first from the ideas which savages have who are now in the condition in which these early people were, and secondly, by a study of the mythology of these early civilizations.

The mythologies of ancient nations were long supposed to have been merely the invention of priests and of poets. The Italian poet Boccaccio, about 500 years ago, appears to have been the first to question this general impression. He devoted most of his time in the latter part of his life to an elaborate study of them, and came to the conclusion that they were allegories symbolizing moral truths, and he undertook to explain many of them from this point of view. Two hundred years later, Bacon took up these investigations, coming also to the conclusion that they were allegories, and he devoted a

* *L'Occan Ancien*, p. 50.

great deal of his time unprofitably to guess at their meaning. Here the inquiry ended until the beginning of the present century, when the scientific study of languages and of comparative grammar, with the important results that followed it, drew attention to these mythologies and an elaborate and careful study of them has revealed the fact that these myths are man's earliest impressions of many matters affecting him, and what is important for our subject, that, while they include many other things, they exhibit the progressive stages of his belief respecting the physical phenomena by which he was surrounded. They embodied and expressed the popular belief and were diminished, enlarged, readjusted or otherwise changed as these early people advanced in civilization, but amid the many changes which they underwent they always continued to express the popular belief. Out of them and based upon them, the priests constructed their theogonies or religious systems, but did not create the myths, nor did the poets, who merely embellished them and gave them a more poetical form.

A considerable portion of them are what are called Nature myths, which show what these early people's ideas were of the earth, of the heavens and of the causes which produced thunder, the lightning, the wind, the rain, the dew, the snow, the hail and the more violent forces of nature which they saw in the destructive sweep of the tornado, the belching forth of volcanic fires and the shock of the earthquake.

All this appears when we investigate the nature myths of these early nations; and as we follow up the myth through its many changes to its more archaic or first form, we find that the conceptions which these early

people had of physical phenomena, were substantially the same as those which we find among people living in a primitive state at the present day.

As a matter of general observation, savages give little attention to physical phenomena or the operations of nature, except where they are personally affected. Bruce, the traveller in Africa, frequently asked the negroes what became of the sun during the night, and whether we should see the same sun or a different one, in the morning; but they uniformly regarded the question as childish, and had evidently never thought upon the subject.* And when Dobrizhoffer, the Jesuit missionary, asked the Abipones, an equestrian tribe of South America, with whom he passed several years, whether the wonderful course of the stars and heavenly bodies had never raised in their minds the thought of an invisible being, who had made and guided them in their course, he received the very practical reply, that their ancestors had never cared to think about such matters, finding ample occupation for their thoughts in the providing of grass and water for their horses.

But where the operations of nature are destructive in their effects, it is otherwise. The impression then made is vivid. Men recognize the existence of a power by the injury it produces, and regard it as their enemy. We find this in our own period. The Payuguán Indians of North America rush out with fire-brands and with clenched fists against the wind that threatens to blow down their huts; the Estonians of Russia throw stones and knives against an approaching whirlwind; the Kalmucks fire guns at the storm; the Namaguas shoot poisoned arrows against

*Park's Travels, Vol. 1. p. 265, and Lubbock's Origin of Civilization, 5.

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it, and in the Aleutian Islands a whole village will unite and shriek against the raging wind.*

They recognize, as I have said, a superior power that produces the effects which they witness, and we learn from the myths that early man's conception of that power was that it came from gigantic animals in the sky resembling those with which he was familiar on earth, such as the fierce beasts to whose constant attacks he was at that early period especially exposed. Thus, in the early Asiatic myths, the thunder is a huge bellowing bull that drags a great wagon across the sky, the noise of the wheels of which is heard in the rumbling sound that follows; the lightning is a great sinuous serpent that darts from the sky with a zig-zag motion and strikes with the same deadly effects as the venomous serpent of the earth, and the whirlwind or hurricane is a great wild boar that tears up the earth as he rushes along. We find the same general conceptions among the American aborigines. To the Indians of the Northwest coast, the thunder is a huge bird that sweeps across the sky, the noise being the flapping of his great wings, and the rumbling sound that is heard is the flapping and cry of the young brood that follows him; and the Tupas of Brazil believe that the watering of their crops is by this great bird, who admonishes them of his presence, by the mighty sound of his voice, the rustling of his wings and the lightning that flashes from his eyes.† Among the Algonquins the lightning was an immense snake,‡ and among the Hurons the hurricane was a gigantic serpent who had on

* J. A. Farrar's *Primitive Manners and Customs*, p. 2. Schwartz, *der Ursprung der Mythologie*, p. 46.

† Brinton, *Myths of the New World*, 2d ed., p. 108. ‡ Id. 118.

his head a great horn with which he tore up the trees and everything that stood in his way.*

These illustrations might be greatly multiplied. De Gubernatis in his work on Zoological Mythology has given an account of 119 mythical animals of this kind ranging from the elephant to the ant; all of which have their prototypes in the animals that exist upon the land, in the water or in the air, in whose existence, supposed attributes and powers man has believed; and I am disposed to think that the worship of animals by the Egyptians, whatever changes it may afterwards have undergone, had its origin in the first stages of their civilization when, like other primitive people, they may be supposed to have believed that the physical phenomena they witnessed, especially in its destructive effects, came from animals in the sky, whose power they dreaded, whom they thought it necessary to conciliate and who consequently became objects of worship as supernatural forces. This appears to me more probable than any of the reasons that have been given for the origin of this strange worship by the many writers who have considered it, from Diodorus Siculus to Wilkinson.

From this first conception of gigantic animals throughout the sky, from whom proceeded all the effects that man witnessed, he came to the further conception of great creatures that not only combined in one the powers of several animals, but were endowed also with human intelligence; as we find in the images of Assyrian gods with the body of a bull, the wings of a huge bird and a human head; thus uniting the greatest animal strength and the fullest power of flight with the

* Brinton, p. 119.

highest intellectual capacity ; after which comes the conception of Gods, wholly in the human form, but with the power of transforming themselves into animals of any kind, and the final conception of one or more superior Gods, the greater deity having his abode in the sun, or constituting the sun itself, the next in the order of superiority being the moon, with the domestic relation between the two of man and wife, the sun being regarded as representing the masculine principle and the moon the feminine ; the first representing the ruler of the heavens and the latter of the earth ; the sun in the oldest civilization, that of Egypt, being worshipped under the name of Osiris and the moon as Isis, or the earth ; and this worship of the sun and moon existed not only in Egypt, but, under different names and forms, in the ancient civilizations of Asia and largely among the aboriginal tribes of America.

The recognition of what was beneficent in the operations of nature was of slower growth, and it was this that ultimately led to the worship of the sun. It was the most conspicuous object in the heavens, the source of light and heat, and the cause of the fertility of the earth, and was therefore regarded, or rather the god that personified it, as the most beneficent thing in the universe. But this was not the case everywhere. To the African, in certain parts of that continent, as well as to the Arab of the desert, it was not the sun, to whose burning heat he was exposed during the day, but the moon, that chased away the darkness and by whose light he could travel in the cool, refreshing period of the night, that was the beneficent deity. But in more northern countries where the change of the seasons brought about

the alternation of heat and cold, the sun was looked upon as the source of all fertility, and the most beneficent of Gods.

To primitive man there was nothing more mysterious than the transition from day to night, from light to darkness, and nothing in the operations of nature is so interwoven in the myths of early nations as this. The general idea was that there was a conflict constantly going on between the great beneficent spirit represented in the sun, by whatever name the Sun God was called among different people, and the spirit of evil, whose form was either that of a great serpent, or dragon, or some other huge object, whom the sun god was constantly attacking or resisting; the conflict between them in the air appearing in the storm, the tempest and the hurricane; the thunder being regarded as the noise of the strife, and the lightning, the darts that were hurled. And when the sun, after his apparent motion across the heavens, disappeared in the west, it was into the abode of the evil one that he went, the region of darkness, from which he arose victorious in the east in all the splendor of the dawn; the dawn being the loveliest object and the most grateful thing in nature, about which, and of its cause, the most poetical conceptions were formed, as that of a beautiful maiden, the goddess Aurora or Eos, who drove in her chariot of light in the pathway of the sun, as he rose, and moved upward, to burst forth in the fulness of his midday radiance.

This conception of a daily struggle between the powers of light and darkness was of Egyptian origin. The Egyptians believed in one supreme being, self-created and eternal, that existed apart and from whom

those higher gods that created and ruled the world, or struggled for the rule of it, emanated. These were especially three: Osiris, or the sun, Isis, the moon or the earth, and Typhon, the evil one or god of destruction, whose name appears to have survived, in the destructive wind of the Southern ocean bearing that name.

The Egyptians, observing the growth, decay and renovation that goes on in nature, believed, according to Prichard's interpretation of their mythology, that the whole world underwent the same process. That there was in the beginning a golden age of purity and innocence, but that man became so bad through the influence of the evil one, that the entire world was destroyed by a deluge and afterwards renewed, beginning again with a golden age. That this destruction and reconstruction had occurred many times, there having been several golden ages, and that there would be more, until at last, the world would be forever destroyed by fire.*

Fire was another physical feature of the earth which to early man was mysterious. Not fire as the means of light and heat, but fire coming out of the earth, as an eruptive flame, or breaking forth in the violence of the volcano. In that part of Asia where fire in this mysterious form was chiefly to be seen, it gave rise to one of the great religions of the world, that of Zoroaster, or the worship of fire, a religion that, in the high degree of its morals and the spirituality of its conception, is the nearest to Christianity of all the ancient faiths.

In the N. W. corner of Persia is Azerbaijan, the most fertile and the most beautiful of the Persian prov-

* Prichard's Egyptian Mythology.

inces. It is the land of the Ghebers or Fire Worshippers; a volcanic table land, exhibiting everywhere the proofs of the former action of fire; and fire is still beneath its surface. To the eastward, jutting out from the western shore of the Caspian Sea, is the lofty peninsula of Apsheron upon which, not far from the town of Baku, is Sourikhani, meaning in the Persian tongue the field of fire, which since at least 1,000 years before Christ has been the holy place of the Ghebers; its selection as such being due to the circumstance that wherever you there bore a hole in the earth, a burning gas springs up. Here is the sacred temple of the Fire Worshippers with its outward wall perforated by numerous chimneys. Within the enclosure in different parts are altars from which an inflammatory gas arises and in the centre, or in the temple proper, which is open on its four sides, there is a huge jet of a greenish yellow hue, which rises to about the height of three feet, waving to and fro, in which the worshippers recognize, and prostrate themselves before, the mystery of a perpetual flame. The worshippers are now reduced to a mere fragment, the chief portion of them being the Parsees of Bombay, and the mystery has ended in the fact that the soil beneath is a great field of petroleum.

The myths, which show what these early ideas were respecting physical phenomena, are found largely in the Aryan mythology, which is the most satisfactory, for when the Rig Veda or Aryan hymns that contain them were composed, this great race was still in the pastoral state and as it was to a very great extent the parent race of the Hindoos, the Persians, the Greeks, the Romans and of nearly all the nations of modern Europe and

America, these myths can be traced through the early mythologies of these different nations, and are thereby more clearly interpreted.

The Aryans, being a pastoral race, filled the heavens above them with imaginary creatures or objects that are found in the pastoral state, such as the bull, the cow, the ram, the sheep and many of the domestic animals, as well as the scenery and other objects that exist in that state. In the clouds they recognized the celestial cow from whose teeming udders came the moisture that refreshed the earth, celestial maidens who drew the water from fountains and poured it down in rain, and in the soft colored light that appears through the clouds was seen the golden raiment of these celestial virgins.* A scudding cloud was a horse flying from his pursuers, and the strong winds were antelopes driven by the *maruts*, who direct their course as they rush across the heavens. It was very natural that a people living in the pastoral state, who had constantly before them the clouds in all the changes and diversified forms they assume, should, being wholly ignorant of their true nature, imagine that they saw in the region above them mountains and valleys, rocks, caverns, gigantic animals and forms in human shape. There were also, in addition to this, to mislead them, those atmospherical or optical illusions, such as the forms of men, animals, and other objects reflected against the clouds, as in the Brocken of the Harz, or the mirage of the desert, the rainbow and the double rainbow, the aurora borealis, the milky way, shooting stars, meteors, comets, and other illusions; and as everything they imagined they saw in the clouds was in motion and con-

* Kelly's Curiosities of Folk-Lore, p. 7.

stantly changing, it was natural also that it should lead to the further conception of what these imaginary beings were doing, and that out of their supposed actions, passions or affections that these early people should weave, or put together those mythic tales or legends, which reveal to us what their ideas of physical phenomena were.

When the myth in its progressive course had reached the conception that the heavens and the earth were ruled by beings in human shape, who were endowed with supernatural powers, great additions were made of gods and goddesses, whose acts, conflicts and struggles with each other, as well as those of their higher gods, made up a large part of the mythology ; and this was further increased by the conception of innumerable invisible spirits of all conceivable kinds that existed in the air, upon the land and in the water, some of whom were malevolent and others friendly, until at last every mountain, hill and valley, every fountain, river or stream, had its appropriate spirit or many of them ; which led, especially among an imaginative people like the Greeks and others of the Aryan stock, to the most poetical conceptions of their nature, powers, influence and acts, and out of this grew a mass of legendary lore, much of which survived to a very recent period in the customs, sports and amusements of the peasantry of Europe when the legend itself was forgotten.

I have thus, at considerable length, for it was difficult to compress within narrower limits so extensive an inquiry, undertaken to show what was man's earliest idea of the causes of physical phenomena. To express it briefly, it was, that it all came from the acts of creatures of his own imagination, that peopled the space

above him, to whose beneficence or malevolence he attributed all that was beneficial or injurious to him that took place in nature, and this continued to be his belief during the rise, maturity and decay of great civilizations. How could he come to any other conclusion? Ignorant of the form of the earth, of its daily revolution upon its axis, of its movement around the sun, and of many physical laws with which we are familiar, there was nothing apparent to him but supernatural agency to account for much that he witnessed. His idea of the earth was such as would naturally arise from his position upon it, and the evidence of his senses; that it was a flat, round plain diversified by the irregularity of mountain and valley, with the concave vault of the heavens above it. This was the fundamental idea alike among savage or civilized races, each race or people supposing that where they dwelt was at, or about, the centre of this plain. The sun was supposed to move around it, and the dark region below, into which he descended, and from which he arose in the morning, was the abode of evil spirits and of the spirits of the wicked among men; the entrance to which the Greeks fixed in the Western Ocean, north of the entrance to the Mediterranean; but according to Moreau de Jonnes, before referred to, the earlier and more general belief was that the place of entrance was the Cimmerian Bosphorus, now known as the Strait of Yenikale or Kertch, that connects the Sea of Azov with the Euxine or Black Sea. It was supposed that this great plain or flat earth was surrounded on all sides by an ocean, and that the vault of the heavens was supported by high mountains which were situ-

ated near this ocean at the extremity of the earth. As to how the earth itself was supported, there were different impressions among different people. Thales, the Greek philosopher, and Seneca, six hundred years after him, thought that it floated upon water or some other liquid substance; Anaximander and other Greeks, that it was in the form of a cylinder, the upper part of which only was inhabited, the cylinder floating in the centre of the celestial vault, because there was no reason why it should move from one side to the other. Hesiod and others appear to have thought that it was fastened by roots, the Chinese that it rested on the back of a great tortoise, the Hindoos, upon four elephants that stood upon a tortoise, the Aryans of the time of the Vedas, that it stood upon twelve columns between which the sun and moon passed through. But our time will not admit of enumerating more of these conceptions.

When or by whom the rotundity of the earth was first conceived we do not know. All that we know is that a late Greek writer, Diogenes Laertius, says that Parmenides,* an aged follower of Pythagoras, who came to Athens in the time of Socrates, was the first person who asserted that the earth was of a spherical form and was situated in the centre of the universe; which may be true, as we know that Socrates believed the earth to be a globe which was kept fixed in its place by the pressure on every part of it of the surrounding atmosphere, which he said he had been told by a learned person. Aristotle, fifty years later, came to the conclusion that it was round, from the form of its shadow upon the sun during an eclipse and from the fact that in going across a

* Diogenes Laertius. B. IX., Parmenides.

level plain or in passing over the sea, the upper part of an object became visible before the lower, and his general view was that the earth stood immovable and was the centre of the universe. This continued to be a general belief among subsequent geographers down to the time of Cosmas, in the sixth century of our era, who disputed it and maintained with what were very ingenious arguments at that time, that it was an oblong plain enclosed upon its four sides by high walls.

In my annual address upon the history of Cartography, I gave a very full account of all that we know respecting the earliest conception of the earth's rotation upon its axis and its movements around the sun. It will suffice for this occasion to state that more than four centuries before our era, it was suggested by Heraclitus of Ephesus (b. c. 513), that the earth moved ; that Philolaus, who was a contemporary of Socrates, maintained that it made a daily revolution around what he called the central fire ; and we have it upon the authority of Plutarch that Aristarchus of Samos, b. c. 280, taught that the sun was a fixed star, that the earth moved around it in an oblique circle as well as upon its axis, a theory close to, if it does not embrace, what was afterwards proved by Copernicus.

But the idea that the earth moved found few adherents. Aristotle did not believe it, and Ptolemy, the last of the great geographers, who wrote in the second century of our era, ridiculed the idea that the heavens were immovable and that the earth turned upon its axis, and the world agreed with Ptolemy for thirteen hundred years. Even the idea that it was a globe could not have met with general acceptance, when so great a

writer as Tacitus, who lived in the first century of our era, disputed it.

It is not remarkable that it should have been so, for the discovery of the earth's form and movement is among the great triumphs of the human intellect. The discovery of its rotary motion and its motion around the sun was especially so, for it was one of those discoveries that could not have been made by chance, but must have been the result of long observation and patient thought ; and when it was reached by some bright intelligence, we can readily see that it was almost impossible to get men to believe it. It was difficult to get a man to believe against the evidence of his senses, that the heavenly bodies that he saw in motion, were really not moving, but that it was the earth itself that was in motion ; that the earth, instead of being the flat plain that he saw, with its mountain elevations and sloping valleys, was in fact a round ball or globe, and that instead of being the steadfast immovable thing, that it appeared to him as he trod upon it, it was flying through space at the rate of 74,143 miles an hour, or more than 20 miles a second.

I have only to add to my former observations upon this subject, the probability that the idea that it was not the heavenly bodies but the earth that was in motion did not originate with the Greeks, but came from the Egyptians or the Babylonians. In descending the Nile the passage in certain parts, as we know from ancient writers, was made very rapidly, and as the descent of the Euphrates was made in boats with a light framework of wood covered with skins, they would pass down that river quickly, so that the optical illusion, when we are sailing rapidly

close to the land, that it is not the boat that we are in, but the houses and objects upon the shore that are in motion, must have been one of constant observation ; and as these two nations watched and studied the movement of the heavenly bodies more than any of the nations of antiquity, it may have been that the apparent motion to which I have referred called their attention to the possibility of phenomena of the same nature in the sky, and that like the boat, it was the earth, and not the stars they were looking at, that was in motion.

The belief that this was an Egyptian idea derives support from a statement made by Miss Amelia B. Edwards in her recent lectures in this city, that inscriptions have been found in Egypt, one of which refers to the earth as one of the moving stars, and another that the earth when created was sent out revolving in space.

What we do know is that, whatever may have been the opinion of a few learned men, the general belief of the people was that everything in the nature of physical phenomena that they witnessed either in the sky, or upon the earth, came from supernatural agency.

This was the case in Rome in the time of Lucretius, whose celebrated poem, upon the Nature of Things, which was written during the century that preceded our era, was largely devoted to showing that thunder, lightning, storms and other physical phenomena were not, as people supposed, the acts of the Gods, but arose entirely from natural causes. If, says Lucretius, Jupiter and the other Gods shake the heavens with thunder and hurl the lightning whenever they see fit, why do they strike with it the innocent as well as the wicked, and if they hurl thunderbolts at men, why do they do so in solitary places?

Is it to exercise their arms and strengthen their elbows? Why does Jupiter hurl his thunderbolts into the sea? Of what does he accuse the waters? And why does he shatter the sacred temples of the Gods, as well as his own temples, even disfiguring his own image?

After an explanation at great length of the Epicurean theory of atoms, which may be called a materialistic theory of evolution of the broadest possible kind, Lucretius gives an exposition of the causes of natural phenomena, which, I infer from a passage in the poem, he had worked out chiefly himself. The explanations he gives are striking for the time, for, although he cannot be said to have entirely anticipated subsequent discoveries, it is remarkable how near he came, in many instances, to the true explanation.

A few illustrations will suffice. The clouds, he says, attract the moisture from the rivers and the ocean, and after being driven about by the winds, return it to the earth in the form of rain. His explanation of thunder and lightning is this: The clouds become heavily weighted with moisture and while they are in this compact state, they are driven by the winds violently against each other, a movement or collision that generates heat, and they have in addition to this heat derived from the sun. The wind, though it is invisible, has a substance, and when it strikes violently against these heavily weighted clouds, it produces fire, as fire flies out when we strike a stone with iron. The winds also, when they blow violently, create heat by their own motion, and in these various ways, he says, nature forms an *attenuated fire* composed of the minutest particles of flame, with the subtlest motions and atoms, so that nothing whatever

can resist it ; indicating very clearly, that he had some conception of the nature of electricity. At the time of storms all parts of the clouds, he continues, are replete with wind and fire. They contain atoms of heat with a vortex of wind compressed within the cloud, which, growing warm by its own motion and by its contact with fire lightning is formed, and this, struggling to escape from its place of imprisonment, suddenly bursts through, and the consequent tearing apart and rending of the cloud are heard in the loud crack of the thunder. In some cases, however, he says, the cloud is so condensed and compact, that the fire and wind within it cannot suddenly burst through but force the cloud down to the earth, in the form of a water-spout.

Earthquakes, he says, are the result of the movement of the air through the caverns, fissures, and open spaces beneath the surface of the earth, where, in addition to these airy caverns, there are hidden rivers, lakes, and pools. The wind crowds itself into these hollow places beneath, where it rages with violent fury, bringing down these vast caverns in violent shocks ; or they fall from age, and, as they fall, the earth at the surface quakes. He wholly ignores all supernatural agency, seeking to explain everything by natural causes, and the examples I have given will show what a close observer of nature he was.

In an address like this it is not possible to state, except in the most general way, what was done by the Greeks and the Romans to advance the knowledge of physical geography. The Greeks, to the time of Aristotle, did little, for the Greek philosophers, from Thales downward, instead of accumulating facts and drawing such deductions as the facts warranted, began by conjectures as to

the origin and nature of things, and, having adopted some hypothesis, sought for such facts as would support it ; a course that, instead of advancing, retarded the development of the physical sciences.

Aristotle wrote upon atmospheric phenomena, especially upon the winds, in which this great man was not as successful as in his other labors. The winds had a great attraction for the Greeks, and their ideas on the nature of this invisible force rendered it especially suitable for the purposes of their poetry. Four are mentioned by Homer and may be taken, as Bunbury has suggested, as representing in a general way the four cardinal points. They were *Boreas*, the North wind, the bringer of fine weather, although strong and violent, *Notus* the South, or wind of sudden squalls, *Zephyrus* the West or stormy wind, and *Eurus* the East wind, which is but seldom mentioned by the poet.* Strabo says that some writers held that there were but two principal winds, and that the other winds were only slight differences in the direction of these two ; which he holds to be erroneous, upon the authority of Aristotle and Timosthenes.†

Timosthenes, B. C. 282, a native of Rhodes, who was an admiral in the fleet of Ptolemy Philadelphus, wrote a book, that is now lost, upon harbors, for the benefit of mariners, in which, as we learn from early writers, he distinguished the different countries in their relation to the Mediterranean, which was then thought to be the Central Sea, by the direction from which the winds came ; enumerating twelve different winds, which was the num-

* Bunbury's Ancient Geography, vol. I, pp. 36, 37.

† Strabo, B. I., C. II., 21.



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ber that Aristotle had previously fixed upon; and the division of winds into the number of twelve appears to have been generally accepted thereafter, for we find Seneca, A. D. 60, stating that there were twelve and no more.

Posidonius, B. C. 86, from observations made upon the tides of the Mediterranean, came to the correct conclusion that they were affected by the influence of the moon. He also studied the phenomena of earthquakes and volcanoes, and appears, from the fragments of his writings that have come down to us, to have had a very clear conception of changes in the earth's surface produced by the movements of elevation or subsidence through earthquakes or other physical causes.

Strabo, A. D. 21, in the account which he gives of different countries, in his geography, the most valuable one that has come down to us, brought together much that related to physical geography respecting rivers, mountains, mountain ranges, climates and other matters; and a century after Lucretius, Pliny the Elder devoted one of the books of his *Natural History* exclusively to an exposition of the earth and the physical phenomena connected with it. Pliny, however, was not, like Lucretius, an original thinker. He was a compiler; a man of great industry, who, it would appear, brought together in this particular book whatever he found in the writings of his predecessors or contemporaries respecting the earth and its phenomena, which he arranged under appropriate heads, adding occasionally suggestions of his own. I infer this from the fact that at the end of the book he gives the names of forty-four writers, many of whose works have perished. In addition to which, some of his explanations are inconsistent

with each other, and in certain passages it is difficult to understand exactly what he means. He represents the earth as a ball fixed immovably in the centre of the universe, around which the other objects in space revolve, a misconception that makes many of his explanations of physical facts erroneous. Yet Pliny's work is very valuable, as it evidently contains a very full account of what the learned believed in his time, and shows that considerable progress had been made in this branch of knowledge. Like Lucretius, he ignores all supernatural agency, his explanations in every instance being from supposed natural causes, and yet, what was remarkable, he was a believer in omens and presages, such as, that earthquakes denoted the occurrence shortly thereafter of some great public calamity. His work was long one of authority, and with him ends what I shall have to say of the ancients.

The subject of Physical Geography in the Middle Ages has been investigated by Dr. Konrad Kretschmer, of Vienna, in a work published during the past year, and I cannot present this branch of my inquiry better than by giving a concise statement of the conclusions arrived at by this learned writer, which are sustained by a great number of passages that he has brought together from the works of various writers of that period.

His conclusions may be substantially stated as follows :

The modern conception of geography was not in any sense possible in the Middle Ages. The spirit of those days was essentially a religious one, and it was deeply fixed in the minds of men that the whole circle of science corresponded in its form to the religious idea. What-

soever failed to manifest a direct relation to the spiritual being of man was thrust aside, or pushed, at least, into the remote background. This was the leading idea, even in the works that professed to give descriptions of nature. Men saw in collective nature only the work of God, and they held, therefore, that religious belief alone was able to form conceptions of nature and to explain the phenomena of the creation. Clement of Alexandria, in the fifth book of the *Stromata*, denounces the heresy which admits a distinction between faith and knowledge, and affirms that these are essentially the same and rest on the same foundation. "I believe," he says, "in order that I may understand." Tertullian will hear of no such thing as inquiry. "When we really believe," he says, "we have no desire to believe anything beyond that which we have. For we accept this one thing, that there is nothing farther that we ought to believe."

With such principles the men of the Middle Ages, instead of seeking the origin of phenomena, assumed imaginary causes for them, and the scientific activity of the period spent itself, not in investigation, but in argumentation. Even after the writings of Aristotle had been made known to Western Europe by the Arabian culture, the theological bias controlled the minds of men, and Physics is always treated in their books as a part of Metaphysics.

The ground was moreover too limited for the construction of Physical Geography. The idea of a division of labor in the field of natural science was not yet conceivable. It was the time of those all-embracing mirrors of nature, encyclopædias and summaries which had the Cosmos in all its parts for their subject, the organic,

as well as the inorganic, world. The term geography is hardly ever met with, but in its place we find the expressions, "the nature of things," "the measurement of the world," "the universe," and "the nature of places." In the cloister schools, geometry included geography and the description of nations and countries.

Two influences dominated the intellectual life of the Middle Ages; the influence of the Bible and that of classical antiquity, and dissimilar as these were, each was regarded as an authority not to be questioned; and the natural world was interpreted, not by observation and by comparison of facts, but by some text from Genesis, or by some passage from Aristotle. It was not under such conditions that a Physical Geography could be developed. So far, Dr. Kretschmer.

When Copernicus, whom Kepler calls a man of "vast genius," in the 16th century had proved that the earth revolved daily upon its axis and moved annually around the sun, and Bacon's inductive method was generally accepted as the proper mode of investigation in the physical sciences, the basis was laid upon which to found such a science as Physical Geography, but many years elapsed before it took that form.

The great age of maritime exploration and discovery from the 15th to the 17th century resulted in the accumulation of a large amount of physical information respecting the earth, but a long time elapsed before it was made use of in a scientific manner.

Bacon, after the publication in 1620 of his *Novum Organum* projected as a third part of his *Instauratio* what he called a *Natural and Experimental History on Phenomena of the Universe*, and prepared a catalogue

of the subjects upon which he proposed to write distinct treatises, or as he called them, particular histories, when his time would permit, which were each to begin with a series of interrogations as to the points to be investigated, and the residue of the treatise was to be devoted to answering them. It was an ambitious undertaking, for he catalogued the large number of one hundred and thirty-one distinct treatises, eighteen of which were to be devoted to subjects chiefly relating to atmospheric phenomena. Of these eighteen projected treatises he prepared only two, one of which he called the "History of the Winds" and the other "On the Ebb and Flow of the Sea," the first of which he published a few years before his death. These two show that he was but indifferently qualified for the investigation of the subjects proposed in these eighteen treatises, for, as Humboldt has pointed out, his mathematical, astronomical and physical knowledge was very limited, even for that age, or as Humboldt puts it, he was in these branches of knowledge "far behind his contemporaries."*

The tract upon the Ebb and Flow of the Sea is, as respects the cause of the phenomena, throughout erroneous. Contrary to what is now accepted, he maintains that the movement is not one of elevation and depression, and the assumption that it was in any way due to the influence of the moon, because of a comparison between its motion and the motion of the moon, he dismisses as a "hasty anticipation;" declaring that "to a careful inquirer, there are certain traces of the truth that may lead to a surer conclusion," and before

* 3 Humboldt's *Cosmos*, p. 106, London, 1851.

setting forth what that "surer conclusion" was, I should state that he did not accept the Copernican theory of the movement of the earth, but refers to the assertion that it rotated upon its axis as an "extravagant notion." He not only believed that the heavens revolved around the earth, but sought to account for the course of the east tropical wind, by the suggestion that the atmosphere also probably moved with the heavens around the earth. His explanation of the reciprocal action of the tides once in six hours was this. Erroneously supposing that not only the heavenly bodies but, as he expressed it, the whole universe moved around the earth from east to west in twenty-four hours, he concluded that the sea, being a fluid, moved also in the same direction and that it would move with the heavenly bodies entirely around the earth, but for the fact that its movement was checked by the two hemispheres, the Old and the New World, which, extending through nearly three zones of the globe, acted like a rampart. This, he says, gives a double reaction to the entire mass of waters, thus making a visible ebb and flow twice a day; there being "a double advance and also a double recoil."*

His treatise on the winds contained many observations respecting them that were accurate. He discarded the idea of the ancients that there was a fixed number of winds, declaring that there was not a region in the heavens from whence the winds did not blow, and that if you divided the heavens into as many degrees as there are in the horizon, wind would sometimes blow from every one of them, as all impulsion of the air was wind; but he recognized the existence of prevailing winds such

* 3. Bacon's Works, 526, Am. ed.

as the trades. He knew that the general cause of winds was the action of the heat of the sun upon the moisture or vapors that arise from the earth, and appears to have had a general idea of the influence of heat and cold upon their movement without exactly reaching the general scientific truth that wind is a current of air in the atmosphere, ordinarily caused by the inequality of the temperature of adjoining regions.* He frequently speaks of the nurseries of the winds in the clouds, or otherwise around the globe, which generate and send them forth; but he was not very clear on this point, nor with regard to the direction of the winds; for his want of knowledge of their deflection from their original line, with respect to the surface over which they blow, by the rotary motion of the earth, made much that he had to say about the causes of the direction and movement of winds of very little value.

It was otherwise with Bacon's great contemporary Des Cartes, whom Hallam calls "the pride of France and the wonder of his contemporaries," for Des Cartes was an excellent mathematician and a good astronomer, who considered that Copernicus had absolutely demonstrated the correctness of his theory of the movement of the earth. Taking that for his foundation, Des Cartes wrote a work upon the physical history of the earth which he never published, or even showed to his friends, when he found after its completion, that Galileo for maintaining the Copernican theory had, by order of the Inquisition in Rome, been thrown into prison and compelled to sign a document abjuring his belief in that theory. Des Cartes in writing to a friend in 1633 says, after hearing of Galileo's

* Cooley's *Physical Geography*, p. 163.

condemnation, that he had almost resolved to burn his papers, or to let no one see them. "If," he says, "the idea of the movement of the earth is false, then the whole foundation of my philosophy is false, for it is so bound up with all the parts of my treatise that I should not know how to detach it, without making all the rest defective. But as I would not, for anything in the world, that any discourse should proceed from me, in which there should be the least word disapproved by the Church, I prefer rather to suppress my work than that it should appear limping and defective"; and he did suppress it.

In the same year, 1633, he published his *Meteora*, a name then used for atmospheric phenomena, from which he carefully excluded any reference to the movement of the earth, but, on the contrary, inserted a passage to the effect that the entire atmosphere moved around the earth from east to west; which, as I interpret the passage, for it had no necessary connection with the subject that he was then treating, was done to satisfy the Church, as it left upon the mind of the reader the impression that the earth was immovable, without the author's absolutely asserting it.*

In this work he investigates the nature of the exhalations and vapors drawn up from the earth by the heat of the sun in producing clouds, winds, rain, hail and snow. Every sensible agitation of the air he regarded as wind; holding that the winds arise from the difference in the nature or constitution of vapors and the irregularity and variety of the surface of the earth over which they blow, for at sea, he says, where there is no irregularity, they blow more regularly and are stronger. Snow, he thought, was formed

* See Appendix.

in the clouds by the cold acting upon the upper surface of the vapors, and that storms and tempests were due to the clouds descending rapidly and driving the air with such force before them as to create a great wind. He considered that thunder, lightning and whirlwinds had their origin from many layers of clouds being disposed one over the other, like stories in a house, and were produced by the upper layers falling with great violence upon those that were below ; and he appears in this treatise to have been the first to explain the cause of the rainbow. He considered, also, the subject of the ebb and flow of the sea, and supposed he had found its explanation in his theory of vortices, which, however, failed to solve the problem, and need not be dwelt on in this place.*

A few years after the death of Des Cartes, Du Hamel, a writer in his day of considerable authority upon scientific subjects, published in 1659 a treatise upon atmospherical phenomena in the form of a dialogue between three persons, Theophile, a zealous believer in the ancients, Menander, a passionate partisan of Des Cartes, and Simplicius, in whom Du Hamel personified himself, who adopts the side of neither, taking, as he professes, from each what he considers the best. The author in so doing and in the general carrying out of his plan showed himself rather unfavorable to, or at least inappreciative of, the views of Des Cartes.

There was nothing connected with atmospherical phenomena that interested scientific men in the seventeenth century more deeply than the subject of the winds. This was due to the opening up of a large

* See Appendix.

portion of the globe during the age of maritime discovery, which made men familiar with the disastrous tempests, hurricanes, cyclones and other disturbances that are so frequent in the equatorial and southern seas, and also the fact of the trade winds and monsoons, a correct knowledge of which was then highly important for the purposes of navigation. The question, therefore, of the origin of the winds, the cause of their movement and their direction was one of great practical value, the investigation of which had not been confined to Bacon and Des Cartes, but had been written upon by Galileo, Fournier, the French geographer, Riccioli, the Italian geographer, Kircher, the mathematician, physicist and naturalist, Boyle, the philosophical chemist, Isaac Vossius, the son of the historian, and others; but the most useful contribution during this period to this important inquiry was a small volume by R. Bohun, of New College, Oxford, entitled a "Discourse upon the Knowledge and Properties of Wind," which he published at Oxford in 1671. The references that Bohun makes throughout his book show that he was thoroughly well informed of all that had been advanced respecting the winds from Aristotle to the writers of his own period. He had not much respect for the opinions of the ancients, or for assertions which he said had "been long received by the world from the great reputation of their authors"; and he especially refers to those which had been set down by Aristotle in his Meteors and Book of Problems, pointing out that Bacon, in respect to the qualities of the wind, had followed exactly in the traces of Aristotle. "The world has been so long imposed upon" says Bohun, "by traditions, that we must in the

first place be thoroughly informed upon all matters of fact to ascertain what hypothesis facts will justify, which must be the result of long experience and observation, for a full collection of the properties and effects of wind must be the work of posterity and may require many ages. I have, therefore," he says, "taken a larger compass than the generality of writers and derive the origin of the winds from several causes which I have rather endeavored to prove from accounts of sea voyages and relations of matters of fact, than to refine on them by any nice speculations of my own." He had, for the time, a very clear conception of their cause, of the condensation of vapors by cold, and the rarification of them by heat, and he gave in his work a considerable amount of useful information that he had collected from shipmasters, especially respecting the trade winds and monsoons, as well as about tornadoes, cyclones and other atmospherical disturbances. He neither admitted nor denied the Copernican theory, and the defect in his book is that he prefers to rely upon such reasons as will accord with the belief in the earth's immovability. He earnestly urged that shipmasters, especially those who made long voyages, should be required to keep a record of their observations that might be available for investigation and comparison ; a plan which the United States Coast Survey, two centuries afterwards, adopted to get information respecting the winds and oceanic currents by what are known as Maury's charts.

With the exception of what may have been done by Des Cartes, and that was not given to the world, no attempt was made to arrange and systematize the large

amount of physical information respecting the earth that had been gathered in the age of maritime exploration, to make use of this new material as a whole and show the results that it warranted, until 1630, when Bernard Varen, a physician of Amsterdam, better known by his Latin name of Varenius, published in that city his *Geographia Generalis*, a work so original, and so unlike anything that had preceded it, that it brought about a new era in the study of geography. He was the first to separate what he called general or universal geography from that which is special or particular; meaning by general geography all which relates to the earth as a whole, and by special or particular geography, the description of countries, and what was peculiar or incident to them. It was not a treatise wholly relating to physical geography, for a large part of it was devoted to what was mathematical, together with other things, such as the art of navigation and the building and loading of ships. The larger portion of it, however, contained what now comes under the head of physical geography, and was remarkable at that time for the extensive and accurate information which Varenius had of the earth's surface and of physical facts relating to it, much of which was not then to be found in books, and must have been obtained by him from shipmasters, merchants or others in Amsterdam, or in records of voyages kept there and in other Dutch cities; for Amsterdam was at that time a great sea-port, which, together with other towns in Holland, maintained an extensive commerce throughout the world, and sent out maritime expeditions to remote or unknown parts in order to open up new sources of traffic.*

*Holland at this period possessed nearly half of the merchant marine of the world. *Emil Michel, Revue des Deux Mondes*, t. 96, liv. 4.

In the log books kept during such voyages would be found everything new that had been observed respecting winds, currents and many other matters that were useful in navigation or important for the purposes of trade, and the enterprising and enlightened merchants that sent out these expeditions would, after these voyages were over, preserve the log books, as what they contained would be of use in further adventures. To this source of information Varenius undoubtedly had access, and the admirable use he made of it appears in the general plan of his book and the way in which it is worked out.*

The work deserves a more detailed exposition of its merits than it is possible to give in an address of this nature. It will be sufficient to say that it attracted the attention of Sir Isaac Newton, who thought so highly of it that he caused it to be reprinted in England, that he might use it as a text-book in his own lectures upon the same subject. It was afterwards translated into English and as translated passed through several editions, and was reprinted in other countries. For a century and a half it was a work of authority in universities and among the learned, and though, during that long period, many geographies were published, nothing of the same breadth and scope was produced† until 1817, when Karl Ritter published in Berlin, the first volume of his great work, *The Science of the Earth in its Relation to Nature and to the History of Man*; a work that during his long life was augmented to nineteen volumes, eighteen of which

* See Appendix.

† Exception must be made of Kant's remarkable lectures on Physical Geography, always a most interesting subject to him. These lectures were edited during his lifetime by his friends and pupils, and undoubtedly prepared the way for others. (See Appendix.)

are devoted to the continent of Asia alone. This work, from the very beginning, raised geography to a higher plane than it had ever occupied before, by disclosing the relation it had to the condition of man, the formation of nations, and the development and progress of civilization. Ritter, as he has said himself, studied geography as the physiologist and the anatomist study the human body, that is, by a careful and thorough investigation of the different parts to get at a better understanding of the unity and general purpose of the whole. To Ritter, every marked peculiarity upon the earth's surface had its function. The height of mountains and the distribution of mountain ranges, the great elevated plateaus, the sweeping valleys, the vast level plains, the arid deserts, the coast lines and situation of continents and of islands, the distributions of oceans and seas, and the great ice-bound regions at the poles, all had their appropriate functions as part of the general organism of the earth ; and this being specially adapted for the abode of man, its geographical features had a direct influence, not only upon his material state, but in the bringing out of his moral and higher faculties : for Ritter was a profoundly religious man and saw, in the enormous body of facts that he had investigated and brought together, an arrangement, made by one great directing mind, that was wonderful in its wisdom, and but imperfectly understood by man.

But the carrying out of a scheme so widespread as this, was not one to bring about such a practical work as the establishment of a science of physical geography. This required a mind very different from that of Ritter. It demanded a man who could bring together the mass

of material that had accumulated since the days of Varenius, for during that long period several new sciences had been formed, and so arrange and present all that was then known of terrestrial physics as to lay the foundation for a distinct and separate science, and that man was found in Ritter's contemporary and life-long friend, Alexander Von Humboldt. I doubt if any man ever existed that had so great an amount of exact and positive knowledge as Humboldt. He was a specialist in six sciences: geography, geology, meteorology, physics, botany and zoology, and beyond this he was a generalizer of a high order, such as the world had not seen since the days of Aristotle.

When I met him in 1851, in his small apartment at Potsdam, he was seated at a table, drawing, as he told me, from memory, the outline of the Peak of Chimborazo, being dissatisfied with an engraving of the mountain in a work that had just been sent to him. I mention this incident to show how vividly the physical features of nature impressed him, and how enduring was his recollection of them.

In 1827 Humboldt delivered at Berlin sixty-one lectures on physical geography, five of which were devoted to its nature and limits, and by these, I may say, the foundation for that science was laid. The other lectures were upon special branches, such as the nature of the surface of the earth, the sea, mountain forms, volcanoes, earthquakes, the distribution of heat, terrestrial magnetism and the geographical distribution of plants and animals. These lectures were largely attended by the most learned and distinguished men in Germany. They created a great sensation at the time and drew

general attention to the subject throughout Europe. One of the results was the publication, by Berghaus in 1832, of the first part of his physical atlas, a work that was completed in 1837. This pictorial aid was of great value, for upon these beautiful charts the eye can take in at once what it is often difficult to convey by words; and in connection with this should be mentioned the researches of Professor Dove of Berlin, the meteorologist, upon the laws of climate and other matters relating to atmospheric phenomena.

There remained one thing more to be done. Humboldt did not publish his lectures. He kept them to be used many years afterwards in the preparation of his *Cosmos*, although others published notes of such parts as they had taken down. What was required, therefore, was that some one should collect all the facts that were then known and arrange them systematically in a treatise that should present a view of the whole subject, and this was done by F. Hoffman, who published in 1838 his "Physikalische Geographie."

In 1848 Keith Johnston published his great physical atlas, and in the same year appeared Mrs. Somerville's *Physical Geography*, which presented the subject to English readers in a most attractive form, for this lady was not only distinguished for the extent of her scientific knowledge, but, like Ritter, she had the rare art of making scientific matters plain to the ordinary reader by her admirable arrangement of the subject, and the clearness and felicity of her style. I know of no work within the same limits that has a great amount of valuable knowledge so perspicuously set forth and so admirably arranged, a characteristic to be found also in



HUMBOLDT

her former work on the Connection of the Physical Sciences ; and as my paper will close with this interesting lady, I may add that, in addition to her great scientific attainments and labors, she was distinguished for the physical beauty of her person, her gentleness, the charm of her conversation, and her truly feminine character in all the relations of daughter, wife and mother. I may add in conclusion that, like Ritter, her scientific researches strengthened her belief in the great truths of Christianity, to which she steadfastly adhered and from which she derived the greatest consolation, as she frequently declared, up to the end of her long life at the age of ninety-two.

APPENDIX.

ARISTOTLE.

Aristotle's theory of the winds is that there is a two-fold exhalation from the earth, the vaporous and the fuliginous, rain being generated from the vaporous and from the fuliginous wind. The moist, he affirms, is not without the dry, nor the dry without the moist; the two are mingled with each other, and contribute to the generation of each other.

The sun, being moved in a circle, at one time becomes northern and at another southern.

When he ascends he raises moisture from the earth and evaporates it; but when he becomes southern, or declines, the vapor becomes thickened and is changed into water, and, falling on the earth, moistens it and the earth returns the fuliginous exhalation, like moist wood. In this way the exhalations generate each other.

There are four universal winds. Two of these, Apeliotes (the East) and Zephyrus (the West) are milder winds; but the north and the south winds are violent.

The cause of this violence is that the sun does not heat the poles, which are cold and moist.

Much rain being produced at the poles, much fuliginous exhalation ascends; and therefore the north and the south winds are vehement.

Winds are not so strong in the middle sea as near the shore, where the fuliginous exhalation rises; and on the tops of the highest mountains the air is tranquil.

The oblique motion of winds is explained in this way: all the air in the upper parts follows the motion of the universe, and the fuliginous exhalation, ascending as far as to the air and not being able to pass beyond it, vibrates to the downward parts and the winds become oblique.

Earthquakes are produced by causes similar to those which generate the winds. The earth is dry, but receives by rain much humidity, and, being heated by the sun and by the inward fire in itself, much spirit is produced both within and without, and the whole of this flows at one time inward and at another time outward. Spirit, being the most attenuated of substances, moves with the greatest celerity, and is on this account especially percussive and motive of bodies.

Thunder and lightning are extruded by compression from clouds, these being most condensed in the upper part, because of the cold, so that the thunder and lightning tend downward to the earth.

(Taylor's Aristotle, London, 1806-1812.)

DES CARTES.

The passage in the original is as follows: *Sed jam speciatim proprietates & generationem principum ventorum contemplemur. Primo observatur, totum aërem circa terram ab Oriente ad Occidentem volvi: Idque hoc loco supponendum erit, cum commodè ratio diduci nequeat, quin totius universi fabrica simul explicetur; quod extra nostrum propositum.*

(Renati Des Cartes *Specimina Philosophiae*, etc. Amstelodami, 1656, p. 175.)

Translation—“But let us now consider particularly the properties and the generation of the principal winds. First, then, it is remarked that the whole atmosphere revolves (is revolved) around the earth from the east to the west: and this will have to be admitted in this place, because the reason for it cannot properly be set forth without explaining at the same time the fabric of the whole universe; and this is foreign to our purpose.”

William Wallace in an article in the *Encyclopædia Britannica* gives this explanation of Descartes' theory of vortices:

The infinite universe is infinitely full of matter. . . . As the movement of one particle in a closely-packed universe is only possible if all other parts move simultaneously, so that the last in the series steps into the place of the first; and as the figure and division of the particles vary

in each point of the universe, there will inevitably at the same instant result throughout the universe an innumerable host of more or less circular movements, and of vortices or whirlpools of material particles, varying in size and velocity.

KANT.

Prof. R. Adamson, in the *Encyclopædia Britannica*, ninth edition (*art. Kant*), enumerates as among the most important of Kant's contributions to physical science: 1. The tract, *Whether the Earth in Its Revolution has Experienced Some Change Since the Earliest Times* (1754). In this tract it is pointed out that the action of the moon in raising the waters of the earth must have a secondary effect in the slight retardation of the earth's motion, and the fact that the moon turns always the same face to the earth is referred to a similar cause: 2. *Explanatory Remarks on the Theory of the Winds* (1756), in which Kant observes that the varying velocity of rotation of the successive zones of the earth's surface furnishes a key to the phenomena of periodic winds; a theory that is in almost entire agreement with that now received.

VARENIOUS.

The originality and value, at the time, of Varenius' work, will be more fully appreciated when it is compared with the best geographical work that preceded it. This was Cluverius' introduction to general geography, the first edition of which was published in Leyden only twenty years before the appearance of Varenius' work and which, in the course of a century, passed through twenty-six editions, a remarkable thing at the period for any book. This geography was a great improvement upon its predecessors, because Cluverius discarded all the imaginary and absurd things that had deformed previous geographies from the time of the middle ages and confined it to what the author believed to be accurately known, and yet this popular geography had comparatively nothing respecting the physics of the earth beyond the statement that it was round, that the winds were named after the 32 points of the horizon, and a brief statement respecting the ocean; his general idea of which was erroneous, for Cluverius adhered to the Ptolemaic theory and believed that the earth stood immovable in the centre of the universe. In fact a few pages embraced nearly all that could be said to relate to physical geography, to which subject Varenius devoted nearly the half of his work.

In his first six chapters Varenius gives an admirable exposition of what geography is, after which he divides his book into sections, every section containing a number of geographical propositions, each proposi-

tion followed by a statement of the reasons and facts that support it. He considers the changes that have taken place in the earth's surface and the causes of them; how the ocean has in certain parts usurped the land and the land in others has encroached upon the ocean. He inquires into the origin of mountains, their rise and depression, why rain gathers around their tops, and gives a description of the principal ones and of volcanoes. The subject of the waters of the earth is extensively examined, from the ocean to natural fountains and mineral springs. He rejects the prevalent belief that the Pacific Ocean is higher than the Atlantic and the Indian Ocean higher than the Mediterranean, maintaining that by physical laws the ocean is of a uniform level throughout, and that there is no foundation for the statement of certain writers that if a canal were cut through the Isthmus of Suez the waters of the Southern Ocean would overflow the whole of lower Egypt. He expresses the opinion that such a canal is entirely feasible, and that this should have been asserted by him two hundred years before the canal was constructed is interesting, when it is remembered that up to the time when De Lesseps began the work of it engineers insisted that it was not practicable, in consequence of the inequality of level between the Mediterranean and the Indian Ocean.

He devotes a chapter to the subject of rivers, the causes that affect their form, their direction, the rapidity or otherwise of their course, the source of their supply and the general office they perform; pointing out the erroneous opinions the ancients had respecting them, especially as to the cause of the periodical rise of the Nile, which he correctly ascribes to the existence of great lakes and the mountains in the vicinity of the equator, and explains why the rise of the river begins and ceases at particular times. But the most interesting investigation he makes in connection with the movement of waters is as to the cause of the ebb and flow of the sea. He reviews the various opinions that had been advanced to account for the regularity of this movement, from the time of the ancients, such as the views entertained by some that the earth and sea were of the nature of a living creature, which by its respiration, caused the ebbing and flowing; of others, that it came from a great whirlpool near Norway, which, during certain hours, absorbs the water and afterwards discharges it in the same space of time. He rejects the theory of Scaliger, which, as stated in the text, was that of Bacon, that the motion of the sea was obstructed by the two hemispheres of the Old and the New World, and reverberated. He considers the cause assigned by most philosophers, that it was owing to the influence of the moon, but he says the question is, what is this influence, and they answer that it is an occult quality, or sympathy, whereby the moon attracts moist bodies;

which, he continues, are mere words signifying that the moon does it by some means, but they do not know why, which is the thing we want.

After reviewing the various reasons assigned, he thinks Des Cartes' explanation of it by his theory of vortices to be the most ingenious, but points out defects in his demonstration which make it contrary to experience, and finally comes to the conclusion that the moon some way or other causes this motion, that the flux is produced by the pressure of the moon, or the celestial matter between it and the sea, and continues no longer than the cause that forces it,* which was about as near to the truth as it was possible to get until the discovery afterwards, by Sir Isaac Newton, of the law of gravitation.

Other subjects reviewed by him are the difference of climates and their cause, the causes of light, heat, cold, rain, etc., and the particular effect of the obliquity or perpendicularity of the sun's rays. The atmosphere is a subject that is especially dwelt upon, and its composition and nature are explained as accurately as the scientific knowledge of the time would admit. As the heat from the sun expands the vapors, he says, they require more room, and as the heat leaves them they require less, and that it is this constant change and interchange, this expanding and contracting that causes the winds, wind being merely a movement of the air; a motion that can be felt and that has force. He rejects the view entertained by some that the movement or commotion, as he calls it, is towards some particular point, as some are circular, and no wind exactly observes the same point, though there are particular or prevailing winds. The general cause, he holds, is the heat of the sun, which rarifies and attenuates the air, causing it to take up more space and press forward the air that encompasses it. That exhalations come from the land as well as the sea, but do not cause wind until they are rarified by the sun's heat, and that other causes are the melting of the snow upon high places and the descending and pressure of clouds from above. He explains the cause of the monsoons, and he gives many facts that he had collected respecting the winds and other atmospheric phenomena; and then follows a very full, accurate and practical exposition of mathematical geography, which takes up a large part of the work.

Until very recently little was known respecting Varenius beyond the fact that he was a physician in Amsterdam, and published his works in that city. It has now been ascertained that he was born in 1622 at Hitzacker, on the Elbe, in Hanover, that he passed his early life at Uelzen, where his father was court preacher to the Duke of Brunswick, that he studied at the universities of Königsberg and Leyden, and went to Amsterdam to practice physic, and died there in 1670.

* Varenius by Duydole, 236, 254.

Appendix.

THE TIDES.

E. A. Wallis Budge in his Babylonian Life and History, page 145, mentions a Babylonian tablet found in 1883, upon which is an account of the contest between the great sea demon of the sea Tiamat and Merodach the Lord of life and light, the mythical conception, as stated in the text, of the struggle between light and darkness, in which, he thinks, an early reference is made to the tides; that is, that "while the fight was going on she (Tiamat) apparently stopped the tides from flowing," which the God Merodach who conquered her rectified.

Strabo B. III. c v. § 9, says upon the authority of Posidonius, that Seleucus, a native of the country adjoining the Persian Gulf, states that the regularity and irregularity of the ebb and flow of the sea, follow the different positions of the moon in the zodiac; that when the moon is in the signs next the tropics, the tides are irregular both in their height and force, and that for the remaining signs their regularity is greater or less, according as they are more or less removed from the signs before mentioned.

Cæsar in the fourth part of the Gallic War, c. xxix, noticed that when the moon was full, "the maritime tides were greatest in the ocean," and Seneca, B. C. 38, speaks of the moon attracting the waters. This conception on the part of Seneca of what is the modern explanation of the principal cause of the regular action of the tides, the moon's attraction, is not so striking in his case, as he was a man of remarkable geographical insight, who was not only convinced of the globular form of the earth, but had the farther conception that what was then recognized as the only inhabitable part of it was inadequate to account for the amount of land that must exist in the same wide circle of the globe and that a great land would be revealed in the future upon the opening up of the ocean at the west; which appears in a passage in his tragedy of Medea, and although this passage has frequently been referred to by geographical writers, it may be appropriately given here, being always of interest as foreshadowing the subsequent discovery of Columbus. It is in these words:

"There will come ages, in the future years, in which the ocean may loosen the bonds of the universe and a great land may appear and the sea may reveal new worlds and there may be no ultima thule on earth."

EARLY EGYPTIAN KNOWLEDGE OF THE REVOLUTION OF THE EARTH.

Miss Edwards, since the delivery of the Address, has kindly given me the authority for the statement made in her lecture referred to in the text.

Ptah, the primordial god, is said, in the great Harris Papyrus, to have "moulded man, created the gods, made the sky and formed the Earth, revolving in space. (Great Harris Papyrus, translated in the *Records of the Past*.)

Professor the Rev. G. Lieblein, in a paper read before the Congrès Provincial des Orientalistes at St. Etienne, and printed in the Report of its Proceedings, quotes from a hieratic inscription of the Pyramid period the following passage: "The Earth *navigates* the celestial ocean in like manner with the sun and the stars."

ENGLAND TWO HUNDRED YEARS AGO.

A REVIEW BY PROF. PAUL CHAIX, GENEVA, SWITZERLAND.

Through England on a side saddle in the time of William and Mary, being the Diary of Celia Fiennes. Edited by the Hon. Mrs. Griffiths. Field and Tuer, Leadenhall, London, 1889. (*Privately Printed.*)

The writer of this Diary was the daughter of Colonel Nathaniel Fiennes, a Parliamentarian officer, and was sister of the third viscount Saye and Sele. She lets us know that "her Journeys were begun to regain her health by variety and change of air and exercise, and wrote down her remarks not likely to fall into the hands of any but her near relations, there needs not much to be said to Excuse or recommend it, being well aware of its *defect* in all, so they will not expect politeness in this book, only insisting on the opportunity of having many imitators among such gentlemen who are reckoned apt to perform the duties of magistrates and members of parliament in the gen^l service of their country, and would not be the worse for having studied their own country as she has done for diversion."

The editor, the Hon. Mrs. Emily W. Griffiths, herself a kinswoman of Celia Fiennes, being a daughter of the present 13th baron Saye and Sele, says in an Introduction that she copied the MS. verbatim because she believes any alteration would spoil its quaint originality.

We are indeed inclined to ascribe to the writer worse than mere quaintness. When we bear in mind that she was a contemporary of Madame de Sévigné, we are sorry to acknowledge that the fair sex in England was a step behind that of France, a defect amply redeemed in our present time.

There is but one date mentioned in Celia Fiennes' MS., namely, 1697. Another clue to its chronology is the description of Queen Anne's coronation and the frequent mention of William and Mary as sovereigns entitled to the gratefulness of the nation. She speaks of the metropolis as knowing it well, and allows us to guess that her regular residence was Newtontony, eight miles from Salisbury (Wiltshire).

The Diary opens with a description of *Sarum* or *Salsbury*, rebuilt after the destruction of Old Sarum by fire, on a low ground irrigated by "a little rivulet of water which makes the streetes not so clean or so easaye to pass in." "The cathedral, notwithstanding its want of a Rising ground to stand on y^e steeple is seen many miles off.—The top of the Quire is exactly painted, and it looks as fresh as if but new done though of three hundred yeares' standing.—There is many good monuments there one all free stone for the lord Georg (name untold), his effiges and ladyes att length on a bed in their Robes and ruffs on pillows; and y^e four pillars are twisted and over it Angels, figures of birds, beasts, flowers and leaves very fine, there sits Justice wth y^e ballance in her hand, one scale laying over the other twisted looks very natural and well, with y^e wreathed work all in free stone with their Armes cut about in Escutcheons all about it; the other is a monument for the Duke of

Summerset all in marble, a large bed his Effigee in garment and ruff all in Coullours, his lady the same only she is laid one step above him because she was Daughter of the Dowager of ffrance (Mary Tudor, the widow of Louis XII) and sister to Henry y^e 7th (8th) of England by her second husband Charles Brandon Duke of Suffolk.—There is the effigee in stone off a doctor that starved himself to death attempting to imitate our Sa- viour to fast 40 dayes—but at 31 dayes end he became sensible of his evil and would have retrieved his life by eating againe, but then by the Just judgment of god could not swallow any thing down his throate."

So much for the author's style, a contemporary of the Princess Palatine, of the *Grande Mademoiselle* of Orleans-Montpensier and of Madame de Sévigné. She takes us hence, a distance of three miles, to Wilton, "a little vil-lage only supported by the Earle of Pembroke while lives there and has a very ffine house with large Courts one within another.—there is a drawing roome with Anti-roome, y^e wanscoat is painted with the whole History of the *Acadia* romance made by S^r Philip Sidney, brother to y^e then Countess of Pembroke and Composed by him in y^e fine woods above y^e house." Then follows a minute description of that lordly residence and its outhouses with especial tribute of admiration to the recurrence of the childish trick of aspersing the earl's guests with "showers of rain all about y^e rooms," the table, in grottoes and even to the entrance of their bed-room.

The continual recurrence in the description of the inner parts of mansions of the word whainscoting under the old shape of whanscoating puts us in mind of the

German word Wand, a wall, as the possible etymology of the now adopted word. In her prodigious and really confused minuteness of description of railings, courts, outhouses, stables, stairs, hangings, tapestries, yards, closets of all descriptions and carpetting, she names but once a "parlour for smoaking," and but once also the illustrious authors of the numerous collections of *fine paintings* adorning the mansions she has visited. Sir Godfrey Kneller is mentioned as the author of many portraits of the ladies who had adorned the court of Windsor.

Her description of Bath in the first pages (12) of the Diary gives us a faithful and complete picture of that place of resort, quite as fashionable in 1695 as it is now, but where the bathers had not yet been subjected to the code of *Beau Nash*. Their manners, then much the same all over Europe, put us in mind of the rather slovenly baths at Louëche. Miss Celia Fiennes was once a witness of much municipal pageantry in the town of Bath, and gives us a full account of the festivals which put a whole population in motion. She is all along partial to descriptions of the watering places, which she calls *spaws*, spread all over England, many of which have now fallen into neglect and oblivion; she speaks of them as a customer, and fully describes the manner of bathing or drinking those mineral waters. She does full justice to Tunbridge (p. 102), Harragate (Harrowgate) (p. 69), Marsborough (Knaresborough), as well as to Alford (p. 11), Horwood in Buckinghamshire (p. 22), Astrop "steel waters," (p. 25), Barnet (p. 99). By a curious contradiction a chapter at the end of her Diary under the head of "Epsome," mentions every place in Surrey ex-

cept Epsom. Her first journey, limited to a few of the southern counties of England, enabled her to describe Winchester, to which she does ample justice, without, however, mentioning the events of which it was the theatre. The ancient abbey of Beaulieu, in the New Forest, called by her Bewley, is scarcely mentioned; but the duties and especially the perquisites of all the keepers and rangers of the New Forest are given at length. She thence crosses to the Isle of Wight, where Carisbrook Castle is mentioned (p. 41) as the "retreat" (not as the prison) of King Charles I. "when he was worsted by Parliaments forces."

The description of the modest and quiet town of Chichester (p. 30) would be deemed exact to this day, with its four streets meeting at the gothic pile called the *Cross*, a most elegant structure, which seems to have been a very common ornament of most of the English cities. But the author says (p. 29) that the market cross at Abington (Berkshire) "is the ffinest in England, its all of free stone and very lofty," a compliment, however, which she pays to several other more northern cities. She gives Chichester estuary credit for lobsters and crabs whose glory is long gone, and to its Gothic cathedral for a tower ascended by 260 odd steps, and for "severall effigies of marble and allabasters of the bishops of the place and one of the Earle of Arundell and his Lady." She says she "went through more of Sussex w^{ch} is much in blind and dark Lanes and up and down Steepe hills, through Arundell parke, belonging to the Duke of Norfolk," a rather erroneous account. She mentions also in the neighborhood of West Sussex a gentleman's house praised "for the great number of yew trees cutt

close in several green alleys," a feature which might be identified in the neighboring park of Goodwood, save for the unimpaired beauty of its trees.

If she is liable to blame for her unexplained silence about Arundel Castle, the famous seat of Roger de Bellesme, baron of Montgomery, Celia Fiennes makes amend by indulging in minute descriptions of insignificant mansions provided they be "new and neat," and we will, at the risk of being tedious to the reader, pick out (p. 23) a few pages on Sir John St. Barbe's insignificant mansion at Rumsey, 6 miles from Southampton : "You enter a Court that's wall'd in and blew Iron gates. The Court has a round in the Middle rail'd in, designed for a Bowling Green, and the Coaches drive round it to Come to the Entrance w^{ch} is severall stone steps to a Broad Space that is rail'd wth Balls and Bannisters : the Space is paved with broad free stone the Stepps the same 8 or 10. The house is a halfe Roman H. Y^e hall is in the Middle wth double doores, its very lofty and large ther's a Chimney just against the Entrance on the Right hand, runns in an Entry through the house to the back yard, where are the offices. Still house and Barnes and Coach houses and a very fine Stable built of Brick—there are large partitions. In this Entry you have the pantry and Cellars and on the other side y^e Kittchin Larders and pastry w^{ch} is one wing of the house and just behind the hall is y^e Servants hall and a Little parlour just by the pantry and back stairs. Then the great hall is divided in halfe by the staircase, w^{ch} hangs on its own work not supported on Either side, to the first half pace and all the way up without Support, on the one Side they are of oake, the railes and

banisters are varnished. The halfe paces are Inlaid with yew wood w^{ch} looks a yellowish red" The reader will forgive us for stopping here to draw our breath, although we are depriving him of two more pages of this style, and of an endless enumeration of more rooms, parlours, stairs and backstairs, of closets, velvet hangings, screens, dining-rooms, kitchens, gardens and kitchen gardens, garrets and waterworks, of spouts all mingled together in unutterable confusion with full display of the author's wonderful powers of sight and observation. She passes unnoticed such places as Pомfret, Warwick Castle and the ruins of Kenilworth, and the names of those who have dwelt within their walls. It might be expected that a lady living in affluence, such as allowed her to spend her leisure in so much travelling, would have qualified herself for the laudable task she had assumed by a study easier in her time than it is to us. But we must make up our mind to acknowledge that in her architectural notions, no building was worthy of admiration that was not stamped with the then prevailing style of the ill-named *Renaissance*, which she calls the *London manner*, and that she would have lent her hand to pull down what survived of those remnants of the Middle Age, which we now admire and which had recently undergone the consequence of the civil wars, and the heavy hand of Cromwell and Waller's fanatical soldiers.

In her excursion to Corfe Castle and the so-called *Isle* of Purbeck in Dorsetshire we read a description of the works at some copper mines now exhausted, and of the process used to convert the ore into copperas like "sugar candy." The author always seriously attends

with better success to explanations of industrial matters. Her description of the Stoneage or Stonidge (Stonehenge) "one of the wonders of England that stands on Salsebury Plaine," leads to the mention of some similar megalithic remnants of less note, such as the "Mottstones that stand by the sea-side in the Isle of Wight," (on the south-west coast) and at Rowle-stone near Brampton, a few miles west of Oxford "where are many such great stones."

Oxford is described at great length (p. 24-29) and not without interest, in a way that allows us to make a comparison with the present state of that sanctuary of learning. The writer does full justice to the pleasant site of the city and to the particulars of its 18 colleges and 6 halls, inasmuch as she claims William of Wickham, the founder of the New College, as one of her ancestral kinsmen, and was very handsomely entertained there, the number of the Fellows amounting to about one hundred. She praises the beauty of the theatre located in the middle of the colleges, two of which were called the Devil and Belial (Baliol) colleges. The first rank is ascribed to Christ Church College, and "in one of the Courts is a tower new built for to hang the *Mighty Tom*, that bell is of a large size, so great a Weight they were forced to have engines from London to raise up to the tower." Miss Fiennes confesses that the Library occupying 2 or 3 rooms "is old and a little disregarded.—There was a very odd custom In Queen College, for every New Years day to give to every Gentleman fellow of the College a few needles and thread with these words: Take this and be thrifty."

A number of pages (99-114) are employed in an

account of her *Journey to Canterbury and Dover*. She there mentions a ferry across the Thames then existing between Gravesend and the fort of *Tilberry* where "the Thames was very Rough and Deep, the Boy was then afloat on the Nore"; and while crossing the Medway at Rochester she gives it the title of "the finest River she ever saw.—The Bridge at Rochester is the finest in England—nay its said to equal any in the world—it is not built upon with houses as London Bridge but it is very long and fine with nine large arches." There is no mention, however, of the dock-yards and naval establishment at Chatham and Sheerness. Her full description of the cathedral at Canterbury is completed by that of an underground chapel: "Under the cathedrall is a Large Church just like S^t Ffaiths under S^t Pauls in London; this is given to the Ffrench protestants in the town for the worshipping God, it holds a vast number of people, its so well arched that they cannot hear them in the cathedrall when singing." Canterbury was indeed the seat of a numerous colony of French refugees who had introduced manufactures of silk in a prosperous state, where she saw many "loomes working severall fine flower'd silks." To the same origin was due the working of "paper mills w^{ch} dispatches paper at a quick rate, they were then making brown paper wⁿ I saw it. The mill is set a going by the water and at y^e same tyme it pounded the rags to morter for y^e paper, and it beate out meale and Hemp and ground bread altogether."

Then follows an accurate description of Dover and all the Cinque Ports on the Straits of Dover, of *Warworth* (Walmer) Castle, since the official residence of the Duke of Wellington, of Dover Castle "standing on the Edge

of a very steep hill on w^{ch} you ascend up to y^e tower 120 steps, whence you discover Callice (Calais) in Ffrance, in some Clear Dayes towards the evening you may see the towers and buildings of Callice." Crossing two arms of the sea now silted up, she entered the Lybertys of Winchelsea which stands on a hill. "Remaines of Churches a.d Halls are to be seen but Else grass grows now where Winchelsea was. There are but a very few houses now, but its y^e ancientest corporation in England, so y^t should Lord Mayor of London meete M^r Mayor of Winchelsea he must give him place : it was as flourishing place before the sea Left it that was in England."

The account of Miss Fiennes' journey to Canterbury and Dover is completed by a full description of the hop-yards, the fruit and eatable products of that fruitful county, of the mineral waters of Tunbridge Wells (which she "dranke many years with great advantage"), of the way they are used by patients, of the "many good buildings and Lodgings that makes them very Cheape, Shopps of all sorts and full of toys, Silver, china, mil-liners, curious wooden ware were numerous. There were also severall good taverns at the walks and all about to supply good wine and Brewhouses for beer and Bakers for Bread."

Then comes mention of Dorken (Dorking) in Surry where are the best trouts in the river, and she closes by merely summing up (p. 108) the number of miles she has travelled, amounting to 1045 ; and this seems to have been her principal care and aim.

The page 48 begins with the following words: *Here begins my northern Journey in May, 1697*, a title which however, leads the reader to the Eastern Counties of

England, setting out with "Andly end (Audley End) a house of the Earle of Sussex w^{ch} makes a Noble appearance Like a town so many towers and buildings off stone within a parke w^{ch} is walled round. The roomes are Large and Lofty with good Rich old ffrurniture tapestry, but No beds in that part we saw. There are 750 (150?) Rooms in the house."

Epping is passed unheeded. She describes the county of Essex as a thriving country and "the whole town of Colchester employed in spinning, weaving, washing, drying and dressing their Bays in which they seeme very Industrious. Great quantities are made here and sent in Bales to London. Colchester is a large town in the compass of Ground. Fformerly there was 16 Churches tho' now much of it is ruined (p. 115, 116). The town Lookes Like a thriveing place by the substantiall houses and well pitched (paved) streets w^{ch} are broad Enough for two coaches to go a breast, besides a pitched walk on Either side. Y^e low grounds all about y^e town are used for the whetening their Bayes. It is also famed for Exceeding good oysters."

Next to Colchester Miss Fiennes visited Ipswich, "a town that Looks a Little disregarded though their streets of a good size are well pitch'd with small stones." By Enquiry she found it to be "through pride and sloth."—"Thence to Wickham 5 miles, but These are all very long miles." The 36 miles after leaving Ipswich she found Exceedingly Long miles (p. 118), and after entering Norfolk she found "the miles much longer than most miles in Yorkshire." She then entered by a Long Causey (causeway) and a Large stone bridge the city of Norwich "walled round full of towers

and surrounded with Low grounds Employ'd to Bleach their woolen stuff the manufacture of the place.—The walls seeme y^e best in repaire of any walled City I Know with Carving and Battlements and Towers Looke well. There are 12 gates in all and 36 churches." Celia Fiennes ascribes the well-deserved prosperity of that important city to its manufactures of *Crapes, Callimanies and Damaskes*, originating with the presence of French Protestant refugees and numerous Dissenters, who have founded schools, hospitals and many charitable institutions.

Leaving Norwich she arrived at Euston hall, the Seat of the Duke of Grafton, and revels in a long and profuse description of the Castle and the pictures she saw there; "one was y^e Dutchesse of Cleavelands pictured in a sultaness dress, the Duke of Grafton being King Charles y^e seconds base son by her."

At Bury Saint Edmunds she did not see (p. 125) any remains of the renowned abbey but a fine gate and some remnants of the walls.—She thence entered the county of Cambridge and went to the residence of admiral Russel, "now lord Orfford," who fought the French fleet at La Hogue.

Nine-tenths of her so-called Northern journey were performed on horseback on account of the state of the roads which are generally called *lanes*, very narrow, very deep (muddy), crossing commons at long distances from each other, through a moorish (marshy) country; a well-deserved reproach at a time when Sir John Rennie had not made his appearance, and when the great works undertaken by the unlucky Vermuyden had been partly destroyed.—Ramsey mere and *Whitosome*

Mer (Whittlesea Mere) are not passed unnoticed and the city of Ely, as well as most of the lands of Lincolnshire are represented as surrounded with "Watery ditches" and flooded lands, the remains of those which had concealed the brave Hereward and the Camp of Refuge.

Celia Fiennes met with many *desseñters* in Essex and at Ipswich, which reminds us of the few faithful followers of John Wyclif's doctrine who were still extant in those parts at the time of Henry VIII. She is also careful to mention the existence of numerous "*desseñters*" and meeting houses in Yorkshire, Lancashire, Cornwall and Devonshire. Next to Cambridge follows a visit to the very old city of Ely and its beautiful cathedral adorned with statues "Very proper," in dress (p. 128) finding unfurnished the bishop's palace, "as the prelate does not care to make a long stay there, on account of the unhealthy site of the town."

What she admires in the elegant mansion of Lord Sandwich at Huntingdon is the *ffretwood* in the ceiling of the dining room carved with Irish oak, because "this wood no spider will weave on or endure." But she objects to a want of clothes in a fine picture of Venus hung over one of the Chimneys. The same objection is repeated three pages farther on to very fine pictures adorning the sumptuous residence of the Marquess of Exeter in Burley (Burleigh) house at Stamford, "but they were all without Garments or very little, that was the only fault, the immodesty of the Pictures, especially in My Lords appartement." Burleigh house draws from the pen of our admiring traveller pages of description and praise, first for its site, which is "the finest she

ever saw, on the Edge of a hill," and especially for its luxurious furniture. "My Lord's Bedchamber was ffurnished very Rich the tapestry was all blew Silke and Rich gold thread, so that the Gold appeared for the Light part of all y^e Worke. There was a blew velvet bed with gold ffringe and very Richly Embroidered, all the Inside with ovals on the head piece and tester, where the figures are so finely wrought in satten stitch it Looks Like painting. There is also My Lady's apartment severall Roomes very Richly ffurnished and very ffine Tapestry with Silver and Gold in Most ; there was at least four velvet beds 2 plain and 2 figured—Crimson-green—Several Coullours together in one ; severall damaske beds and some tissue beds all ffinely Embroydered. My Lady's Closet is very ffine, the Wanscoate of the best Jappan, the Cushons very rich work : there is a great deale of ffine Worke under Glasses and a Glass case full of all sorts of curiosities of Amber ston Currall and a world of ffine things." We will not follow the author in the over-full and confused description of the drawing-room and of the twenty other rooms ; for, "there are at least 20 roomes very Large and Lofty that are all painted on the top ; there are at least 20 on the other side of the house all with different frett work on the ceiling, besides almost as many more roomes that are a building.—The great variety of the roomes took me up two full hours to go ffrom one roome to another over the house. The bowling-green, Wilderness, nor Walke I was not in, being so great a tract of ground ; it is esteemed the ffineſt house and ſituation that is in England and will be *very compleate when ffiniſh'd.*" We must give the author credit

for her quickness of perception. She travelled next to the old city of Lincoln, covering a very high and vast hill crowned by the "Minster very perspicuous and Eminently in view a great many Miles off. The tower, that Great Thoms nest, is 250 steps up, 8 persons may very well stand up in the hollow of the bell together, its as much as a man can reach to the top of the bell with his hand when he is in the Inside; its rarely Ever rung but only by Ringing the Clapper on each side.—The Sea has formerly come up to the town and y^e has been very deep water where now great part of the town is built" (p. 55).

Celia Fiennes entered next the county of Nottingham, acknowledging the beauty of the Forest of Sherwood and that of the river Trent, "tho' not so broad as the Thames is at Kingston." She mentions the park of Welbeake (Welbeck) a seat of the Duke of Newcastle, the former abbey and manour Worsup (manor of Worksop), "a very fine pile of buildings built by a Coeheir of the Devonshire house," without any notion of the title of Earl Marshal of the Kingdom vested in the possessor of that Manor, and owned by the Dukes of Norfolk. She takes leave of it with the following remark: "The gardens are very neat and after the London Mode, of Gravel and Grass walks and Mount, and the Squaires with dwarfes and Cyprus (cypress) ffirse and all sorts of Greens and fruite trees, holly trees, box and ffilleroy ffinely cut. I Eat good fruite there." Hampton Court is her favorite type of architecture "had it only been completed by the good queen Mary." The roofs of mansions are frequently termed *Leads* and *Ledes*, which shows that

lead was beginning to take the room of tiles and *slatts* (slates) in the roofing of opulent houses. Timber was still employed in most of the buildings of the southern parts of the kingdom, stone being exceptionally mentioned, as is also flint, as giving a dark appearance to some of the buildings of the town of Norwich.

Bridges were commonly built of stone and very high above the level of the water, which she takes as an indication of the powerful floods in the northern counties. Rivers are seldom named and often misspelt. The Nene flowing by Northampton and Peterborough she names *Lin*. "Bedford its washed by the River Ouse which Comes from Buckingham till it reaches York." She locates Manchester on the rivers Uval or Ouall and Shark (Irwell and Irk). Similar errors are repeated on the Scotch borders, where the Esk is called Essex and the Eden *Emount*. But, although she pays due attention to the nature of the soil, be it clay, chalk, sand or stone, her greatest concern is the presence and actual tasting of fish, crawfish, lobsters, in all the waters she meets with, and their degree of excellence. On two occasions, however, she passes by (p. 51, 131) Shilton (Stilton) in the county of Huntington, without mentioning the delicious cheese which gives it now its well-deserved renown, adding (p. 97): "I eate a great quantity of y^e Red Coralina Bedford Goosbery."

Impressed with due admiration of the beauty and fertility of the country around Nottingham Miss Fiennes says that "the Manufacture of the Town mostly consists in weaving of stockings w^{ch} is a very ingenious art. Nottingham is also ffamous for good ale, so for Cellars, they are all dug out of the Rocks and so

are very Cool. Att y^e Crown Inn is a Cellar of 60 stepps down, all in the Rock Like arch work over your head : in y^e Cellar I dranke good ale." The town is described as built with good sized, well paved streets, and Nottingham Castle seems to have been still kept as a royal residence, standing on a very high hill, with a flight of 40 steps to the court and hall. The state rooms were lofty, wainscoted with cedar and hung with rich tapestries and embroidery. In one of them was received the Princess Anne when she fled from her father James II. "From the Leads (roofing) and at a distance we see Beavior (Belvoir) castle the Earle of Rutland's house," in Leicestershire.

From the description of Leicester let us take her visit to St. Martin's Church, where she "saw Hyrick's tomb who was Major of the town and was married to one wife 52 years in all, w^{ch} tyme he buried neither man, woman or child tho's most tymes he had 20 in his family, his age was 79 and his widow 97 at her death, she saw 162 of her posterity together." As a rare mention of historical events, she notes the field of Bosworth where King Richard III. lost his life, and Narsby (Naseby) where was the great battle fought between King Charles y fst and the Parliament of England, and then came to Woolsey where she stayed six weeks at Sir Charles Woolsey's, married to one of her aunts, and "found plenty of crawfish the sweetest and Largest she had seen anywhere, trouts, eels, tench, perch which Eates in perfection." The sojourn at Wolsey, many times repeated, gave her opportunities to become acquainted with the neighboring counties under her relation's guidance and to get a full

knowledge of all the *Seven Wonders of Staffordshire*. The Diary carries the reader to the many curiosities of the Peak, Chatsworth, Buxton, the marble quarries, mines of copper and spar, Haddon hall, Poole's hole, Elden hole. It cannot be denied that, notwithstanding her vulgarity and matter of fact turn of mind, the authoress was endowed, though to a less degree, with a leaning to the observation of the beauties of a landscape; but the quaint descriptions she gives do not depict them and impart to her reader a share of her enjoyment. In the few stiff lines (p. 199) which give an account of her visit to the Duke of Beaufort's house at Babington (Gloucestershire) we must acknowledge that she shows some sensibility to natural beauties. Her description of Chatsworth, the Duke of Devonshire's residence, does not tally with its present splendors, and she always goes astray among *whanscoating*, hangings, embroideries, carvings, kitchen gardens, orchards, pantries (without giving us an insight into the way of living), hunting of the owners; and she revels in long straight alleys of dwarf trees, cypress trees, "rows of Ewe (yew) trees very uniform and Cutt neatly."

Her descriptions of landscape picture to us extensive walled-in parks, and long *lanes* instead of roads, *impossible* (impracticable) for coaches, narrowly enclosed between hedges, or quicksets which she calls *enclosures*.

Among the numerous gentlemen's seats we read of Kamwood and *Boudesworth*, both the property of Lord Paget; under the last name we are fain to guess Beaudesert in Staffordshire, the seat of the marquess of Anglesey, the head of the Paget family.

To one of her other trips attaches a far less heroic as-

sociation, but of more present interest. After a stay at Chester, Celia Fiennes was taken across the Dee to a place on the borders of the Welsh county of Flint, the residence of a clergyman named D. Percival, whose wife was a relation of hers. "His parish was eight miles in Extent and two lordships in it, and y^e ruines of two great Castles in it remains." She calls it *Harding*, a misspelling under which we must recognize the seat of Mr. Gladstone, Hawarden Castle, pronounced *Härden*. Celia Fiennes was thence taken by her kinswoman to Flint, which she declares (p. 149) "a very Ragged place, many villages in England are better." She was on her way to St. Winifred's Well, called Holywell, which she describes at length as being much resorted to, especially by Papists, both as a healing and a sanctifying station. "It was a Session Tyme at Flint w^a I was there w^{ch} shewed it at its prime," and she remarks that during her numerous visits to all sorts of places in the Kingdom she very often has the chance of arriving on market days or during the festivals, pageantry, sessions of courts, electioneering, etc. At Richmond, in Yorkshire, "I met with the Clutter of the Choosing Parliament men" (p. 184).

We will attempt to establish a comparison of the infant state of the mining industry, borrowed from her numerous remarks on that favorite topic. Besides the copper mines in Dorsetshire and coal mines in the neighborhood of Salisbury, now exhausted, coal mines were worked in Flintshire (p. 151)—coal from Warwickshire was carried to Worcester on sledges—coal mines were found on arriving at Shrewsbury (p. 109) and at Chesterfield in Derbyshire (p. 77). She says of Wiggton (Wigan) in Lancashire, "there is that ffine channel coale

are in perfection, burns as light as a candle." The coal trade of Newcastle was paramount, as it is to this day under the name of *sea-coal*, and during Celia Fiennes' visit to the port of Scarborough in Yorkshire, 70 ships were seen in the offing sailing as colliers towards the Tyne (p. 73). In her frequent recurrence to the topic of coal mines of Staffordshire, she decidedly elucidates, and is decisive on the question of the orthography of the name of the famous *candle*, *channel* or *cannel coal*. "Not farre from hence (Wolseley) they have y^e mines of the fine sort of Coale that is hard and will be polished like black marble for salts or boxes, y^e only difference, it will not bear the fire as marble does. This is y^e pitt coale, y^e cloven and burns like a candle and makes white ashes Like y^e Scotch coale. The same sort is in Nottinghamshire (p. 90). Their fewel is altogether Coales w^{ch} indeed are very good and plenty, you might have a load for 3 or 4 shillings brought home that would serve a poor mans family y^e winter. Its in great pieces and so Cloven burns light so as the poorer sort works by it and so it serves for heate and light: its very shining Coale all about this country tho' they Complain they have lost the vein of the best sort which they have still in Wales and Lancashire" (p. 137). Be it also remembered that our author gave the same praise (p. 4) to the *Mindiffe* (Mendip hills, north of Glastonbury) coal extracted in the neighborhood of Warminster. Her attention being alive to all sorts of mineral produce, she names the marble quarries of the Peak, of Cumberland (p. 163), of Plymouth (215), the black lead of Cumberland (p. 157), the stones known under the name of diamonds in Cornwall (p. 219), near Bristol (p. 201), and in the vast cavern of Oaky

hole (Wookey), one mile west of Wells, in Somersetshire, where she saw marvellous stalactites and "rocks Glistening and Shining Like Diamonds and Alabaster" (p. 205).

In her journey through Cheshire and the salterns around Northwich, she says (p. 188): "They have within these few yeares found in their brine pits a hard rocky salt that Looke clear Like Sugar Candy." She also visited all the other salt works of Nantwich, Middlewich and even Droitwich in Worcestershire. In household matters she describes (p. 136) the process by which ferns were allowed to grow even at the expense of agriculture, in order to be burnt and the ashes brought to market in the shape of balls, as substitutes for soda and soap. She is a quick observer of manufactures and a clear-sighted describer of all industrial processes, the "worstead trade, spinning and weaving at Kederminstor (Kidderminster), a large town (p. 195)," the knitting of stockings at Gloucester (p. 197), the serges at Exeter (p. 207), and the "Linnen Cloth and Cottenstickings w^{ch} is the manufacture of Manchester" (p. 187).

The description of such tracts as are of a hilly nature impresses the reader with a sense of exaggeration, as in the account given of the Malvern hills and the very tame Downs of Sussex. On her journeying from Halifax to Lancashire she says (p. 186): "That w^{ch} adds to the formidableness of Blackstone Edge is that on y^e one hand you have a vast precipice almost the whole way both as one ascends and descends, and in some places y^e precipice is on Either hand. This hill put me in mind of y^e description of the Alps in Italy and of y^e acc^d My father gave of those Alps when he passed

them and I could not but think this Carried some resemblance tho' in Little. From the foot of this Blackstone I went to Rochdale 4 miles a pretty neat town built all of stone. Here is a good Large Meeting place well filled; these parts Religion does better flourish than in places where they have better advantages. Here I observed the Grounds were all Enclosed with Quicksetts cut smoothe and as Even on ffine Greene Bancks, and as well kept as for a Garden and so most my way to Manchester I Rode between such Hedges."

Let us now follow our author through those northern counties in which industry and trade have reared enormous cities which she saw in their infancy and describes with due regard for their laborious beginning. At Manchester she visited new churches, almshouses, well-kept schools for "blew Coate boys, drinking of their beer w^{ch} was very good, a very fine Schoole for young Gentle-women as good as any in London, and music and dancing and things are very plenty here—this is a thriveing place." Rudimentary collections of anatomy and natural history were an appendage to a school for surgeons.

Liverpool, visited on a previous trip, is described (p. 152) as a "very rich trading town, y^e houses of Brick and Stone built high and even that a streete quite through Looke very handsome, after the London fashion—well pitched. There are abundance of persons you see well dressed and of good fashion, the streetes are faire and Long, its London in miniature as much as I ever saw any thing." From Liverpool and Preston, and from Lancaster, "a town old and much decay'd,"

we are to follow our bold tourist to the lakes of Cumberland and Westmoreland and content ourselves with a very sober tribute of admiration given (p. 165) to the scenery : "they are standing water with exceeding good ffish." There is but one mention of the ill-fated *earle of Darentwater* (Derwentwater) whose domains were subsequently forfeited to the Crown after his rebellion, and, after a long picture of the now princely mansion of "Louder hall (Lowther hall)," she expatiates in very practical directions about the curing of the Charrifish, the mode of potting it, the troublesome presence of rhye bread which always disagrees with her, and the complicated mode of kneading and baking those clap breads of northern counties.

The city of Carlisle is described at length with praise (p. 160) as gracefully watered by the river Emount (Eden). Celia Fiennes ventured over the Scotch border into the county of Dumfries, watered by the river Essex (Esk), and it required no little amount of boldness to do that at a time of permanent disturbance, poaching and smuggling, among outlaws and about ten years before the Union, which scarcely put an end to that unsafe condition of affairs. The consequence was sloth and poverty. The roads were mere paths, affording but little convenience to the solitary traveller across dreary heaths. The paths were no longer provided with those posts and hands, which remind us of Dr. Syntax setting out on his travels and consulting them when in forlorn ignorance of the way he was to take. "These (Scotch) people," says C. F., "tho' with naked leggs are yet wrapp'd in plodds (plaids) a piece of woollen Like a Blanket, or Else rideing hoods—and

this when they are in their houses. I took them for people which were sick, seeing two or three great wenches as tall and big as any woman sat hovering between their bed and Chimney corner, all idle doing nothing tho' it was nine of the clock when I came thither, having gone seven long miles that morning—they have no chimneys, their smoke comes out all over the house and there are great holes in the sides wth Letts out the Smoake.—Not withstanding the cleaning of their parlour for me I was not able to bear the roome; the smell of the hay was a perfume and I rather Chose to see my horses Eate their provender in the stable. My Landlady offered me a good dish of ffish and brought me butter with the Clap bread, but I could have no stomach to Eate.—So I bought the ffish She got for me w^{ch} was full Cheape Enough, nine pence for two pieces of Salmon halfe a one near a yard Long, and a very Large trout of an amber ColLOUR, soe drinking w^{out} Eating some of their wine which was exceedingly good Claret (smuggled of course) and indeed it was the best and truest Ffrench wine I have drank these seven year, I had the first tapping of y^e Little wessell and it was very ffine and clear. Thence giving up my intended journey to Edenboroug I took my ffish to carry it to a place for the English to dress it and re-pass'd the Sark and the Essex."

Due praise is given to the beauty of the cathedral of Durham where she noticed "severall ceremonyes and rites retained from the tymes of the papists who are numerous, but its New Castle that has the greate meeting place and many Descenters; they have two very eminent men one of their name was D^r Gilpin whose

book I have read in." Thence entering Yorkshire our traveller comes to Richmond, crowned by the ruins of an old castle, but "so decayed and sad shattered that it is like a disregarded place and there were only two good houses, one belonging to M. Darcy the Earl of Holderness's brother."

Celia Fiennes's repeated journeys to Yorkshire had been prompted by the care of her health and the use of the mineral springs of Haragate (Harrowgate) and Knaresborough, and here again, as well as at the Holy well of St. Winifred, some superstitious feelings as well as worldly views brought Catholic pilgrims to resort to those *spaws* which she calls "stinking on account of Brimstone. Bones are secretly dug out of the ruins of an old abbey and taken away as sanctifying relics."

In praise of Leeds our traveller has much to say, being fond of new cities, as "it is a Large town, severall Large and broad Streetes, Cleane and well pitch'd and good houses all built of stone. This is esteemed the wealthiest town of its bigness in the Country its manu-facture is the woollen cloth, in which they are all em-ployed and are esteemed very Rich and very proud ; here if one calls for a tankard of Ale w^{ch} is always a groate, their Ale is very strong, but for paying this Groate for your Ale you may have a slice of meate or Else butter and Cheese gratis into the Bargaine—This town is full of dissenters, there are two large meeting places, here also a good schoole for young gentle-women." She says quite as much of several towns in Devonshire and Cornwall, those western parts in which Monmouth found the greatest number of his adherents,

and Jeffreys made the greatest number of his victims under James II.

Of the now large and prosperous city of Halifax she writes "she resolved not to goe to that ragged and almost ruined town (p. 186) and y^e Engine that town was famous for to behead their Criminalls at one Stroake wth a pully was destroyed since their Charter was taken from them." Few people are aware that the *guillotine* was not of French origin. She does full justice and gives a full tribute of praise to the beauty of York Minster, especially to the vast proportions of the lofty windows which adorn the Quire (Choir) and to their pictures, but she finds fault with the narrow streets and the old-fashioned houses too much clustered together and the bridge over the river Uise (Ouse) which is obstructed, being built upon with houses as was the old London Bridge and the bridge over the Avon at Bristol, while she praises the bridge over the Medway at Rochester for the reverse. From the few lines given to York Minster she soon goes astray (p. 58, 66, 68, 69 and 74, 77, 198) on fish cooking, codfish, salmon, pigs of Rippon and Chesterfield ale "generally esteemed the best in the Kingdom." She mistakes the river Derwent in Yorkshire for the one which flows through Derbyshire.

She experiences a special and well-deserved fondness for Herrifordshire (Herefordshire), which she repeatedly visited, not indeed exclusively for its smiling landscape, but also for its fruitful orchards (p. 8) and its skilful method of cider pressing. She several times mentions (p. 33, 287, 191 and 268) the Manborn or Manbern Hills (Malvern hills) which rise like the Alps between Herefordshire and Worcester-

shire and "seem vastly higher than these in the neighbourhood of London and whose descent is as long and steep in some places as its riseing was." As a compensation for such comforting truisms and for a dry and prosaic description (p. 196) of the New House built at Stoake by her relation, M^r Folies, let us borrow a few lines which were written at the same spot by Motley (Letters II., p. 298) when he spent a few days at Madresfield Court, "an old moated house dating far back into the Plantagenet days, belonging to Lord Beauchamp, who took me one day to visit Witley, the magnificent place of Lord Dudley, which I did not admire. They say that £200,000 have been spent in remodelling and furnishing it since he bought it of Lord Foley. But it is altogether too smart, gilt gingerbread. We ascended to the summit of the Malvern hills, and enjoyed the view over the smiling hills of Herefordshire on one side with the hills of Wales in the background and the wide sweep and beautiful highly cultivated hills and dales of Gloucestershire, Worcestershire and I know not what else. Another day I went with Lord Beauchamp to Worcester to visit the cathedral, which is not a very admirable church. We went duly through the famous Worcestershire potteries, passing on the road a splendid villa built by the proprietor of the Worcester Sauce and subsequently I went with Lord Beauchamp to Tewkesbury, famous for the bloody meadow fight, for its beautiful, stately, most imposing Norman Abbey and for its mustard." *Sic transit gloria.* Celia Fiennes' crooked journeys, which we cannot but envy her, led her to many of the finest middle age monuments, which are very dryly disposed of; the abbey of S^t Alban's (p. 98) out

of repair, the Cross at Coventry (p. 91, 92),—Warwick with the monument of the “great Earle of Leisters and his Ladyes in stone curiously.”

As she includes a trip to Cornwall in the Diary of her *Great Northern Journey* we must still follow her westwards. Over hills and vales and through the *lanes* of Somerset and Devonshire does she approach Exeter, conspicuous only from a distance of one mile, with the river Ex and its estuary further on. She expatiates on its prosperous industry: “Exeter is a town very well built; the streetes spacious and noble are well pitch'd, and a vast trade is carried on; as Norwich is for crapes and Damaske, soe this is for serges. There is an Incredible quantity of them made and sold in the town. It turns the most money in a weeke of anything in England. One weeke with another there is 10,000 pounds paid in ready money, sometymes 15,000 pounds. The weavers bring to market their serges and must have their money w^{ch} they Employ to provide them yearne to go to work again.” She describes to perfection the intricacies and beauties of Plymouth harbor, and she saw in the distance Eddystone Lighthouse building “with God's mercy,” p. 215.

On the year following that protracted journey C. Fiennes accomplished a much shorter one in the Metropolis and its vicinity, to Windsor, Eton, etc., giving us a full and minute description of the municipal constitution of the City of London, its regulations and ceremonies, Houses of Parliament, Inns of Courts and Courts of Law, the pageantry of the coronation; and shows herself fully conversant with those practical business matters.

GEOGRAPHICAL NOTES.

THE ANGLO-PORTUGUESE QUESTION.—This Society has received the Protest, sent out by the Lisbon Geographical Society on the 13th January, 1890, to the Academies and Societies, with which it maintains relations.

In this document the Lisbon Society states, from its own point of view, the causes which led to the difficulty between Portugal and England, and to the English *ultimatum* of January 11th; and solemnly records its protest against this *ultimatum* as the culmination of a policy characterized by injustice and by violence.

The Madrid Geographical Society, in a letter dated January 15th, energetically supports the Protest, and calls upon kindred associations throughout the world to unite in condemning the English aggression on the rights of Portugal in Eastern Africa.

The American Geographical Society respectfully acknowledges these communications, but can have no opinion to express with regard to the matters in dispute between England and Portugal.

GEOGRAPHICAL SOCIETY OF THE BROOKLYN INSTITUTE.—This Society was organized, as a Department of the Brooklyn Institute, at a meeting held on the 7th of February, 1890. The purposes of the Society are thus set forth :

"It is expected that the Department will conduct popular courses of Lectures on Physical Geography, Political Geography, Historical Geography and Ethnographical Geography ; that it will afford opportunity for the presentation of technical, scientific and scholarly papers on various branches of Geographical inquiry for discussion by the Department, and for publication ; that systematic courses of lectures on special subjects will be provided for the benefit of those who may be particularly interested in Geography either as teachers or students ; that it will stimulate a practical interest in the subject in the community ; and that it will co-operate with libraries and other educational institutions in their efforts to improve the methods of teaching Geography, and of making known the great wealth of information available on this very important and very practical subject."

In the few weeks that have elapsed, sixty members have been enrolled, and there can be no doubt that the Brooklyn organization is called to do serious and useful work.

AN INTERESTING DOCUMENT.—The *Bollettino* of the Italian Geographical Society, for December, 1889, has a note on the directions to his son Diego, written by Columbus before setting sail on his third voyage.

The document, which has never been published, forms part of the great Vargas Ponce collection in the library of the Academia de la Historia, at Madrid. It is a faulty copy of the original, but the only one known, and will be brought out *in extenso* in the Memorial Publication, which the Italian Government is preparing for the year 1892.

In advising his son, Columbus treats separately of the duties he owes to his own family, to his sovereigns, and to society in general. He commends to his care, in most affectionate language, Beatriz Enriquez, the mother of Fernando, and requires him to pay to her an annual sum of 10,000 *maravedis*; and he further exhorts him to have especial consideration and regard for the Admiral's brother Diego and sister-in-law, Violante Muñiz.

In his relations with the king and the queen, Diego is to show himself always devoted and obedient, and to be modest in applying for favors.

The Admiral admonishes his son, in the name of God, to be kind and charitable to his fellow men, and to treat them all, the powerful and the lowly, with equal fairness. He charges him more particularly to bestow upon the suffering and the needy the tenth part of his disposable means, from whatever source derived; and impresses upon him the necessity of keeping a monthly account of all his expenses. Finally, he refers Diego, in all difficulties, to the wise counsels of his father's most cherished friend, the friar Gaspar Gorricio.

THE FIRST SKETCH OF THE ERIE RAILROAD.—A pamphlet, recently presented to the library of this Society by one of the Fellows, is a document of some historical interest. It is the second edition of a "Sketch of the Geographical Rout of a Great Railway, by which it is proposed to connect the canals and navigable waters of New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Missouri, and the adjacent States and Territories opening thereby a free communication at all seasons of the year, between the Atlantic States and the Great

Valley of the Mississippi. New York: G. & C. & H. Carvill, 1830."

The author's name is not given, but a written memorandum on the cover ascribes the sketch to W. G. Redfield. The *rout*, as described in the text and shown on the accompanying map, leaves the Hudson River at the Tappan Sea, passes through the Delaware and Susquehannah valleys and across the head-waters of the Genesee to the valley of the Alleghany, thence across the Ohio Canal and the head-waters of the Wabash, in Indiana, to the head of steamboat navigation on the Illinois; and reaches the Mississippi River immediately above the Rock Island rapids.

Great care seems to have been taken, in planning the line, to avoid the great lakes, as well as the neighborhood of large towns, and to intersect as many canals as possible: principles of construction which the reader finds it difficult to harmonize, until he comes to the statement on page 17, that "The use of railways does not result in that deterioration of morals which usually attends the business of canals, and which is occasioned by the unhappy influence that boatmen often exercise upon each other, and upon the society with which they mingle when unoccupied. A single person is sufficient to conduct a load on a railway, and his attention is necessarily engaged by the duties of his employment."

Mr. Redfield was clearly persuaded that the railway conductor would be a missionary of redemption to the depraved canal boatmen; and this he might have been if the railway had followed the great Geographical Rout.

The gods would not have it so, and the projector's

calculations were brought to naught. He enumerates among the advantages of the railway, as compared with the canal, that the former is less liable to interruption and to accident, that it occasions less general hazard and loss of life, and that its cost is not more than half or two-thirds that of a canal *through the same rout*. The cost of canals is said to average about \$17,000 per mile, though it often exceeds \$22,000,— while “a single railway, or one set of tracks, with suitable turn-outs, will cost from \$7,000 to \$8,000 per mile, and a single railway, with turn-outs, and graded sufficiently wide for two sets of tracks, will cost from \$10,000 to \$11,000 per mile.” A railway, with double tracks throughout, from the Hudson to the Mississippi could be built, it is affirmed, for \$15,000,000; “little more than half the annual amount of the national income.”

Americans are urged to this conquest of mind over the inertness of matter by the example of the ancient Romans, who could cross hills and valleys, “with their stupendous *appian ways* to subserve the purposes of ambition and conquest;” though it must appear to be a doubtful advantage that, with means for moving military forces and materiel “with a rapidity resembling that of an express-rider, we should have little occasion to claim the respect of our proudest foes, whether savage or civilized.”

Things have changed since 1830, when Mr. Redfield could only refer to three railways in the United States as in full operation: the Quincy road, 7 miles long, in Massachusetts, and the Mauch Chunk, 9 miles, and the Lackawaxen, 16 miles long, both in Pennsylvania. Those commenced and in progress were: the Baltimore

and Ohio, of 350 miles, the Baltimore and Susquehannah, of 48 miles, the Richmond and Chesterfield, Va., of 12 miles, the Columbia, from Philadelphia to York, of 96 miles, and the Pottsville, Pa., length not given.

Others named, as authorized by law, or soon to be undertaken, are: the Massachusetts, 200 miles long, from Boston to the Hudson, the Boston and Providence, 43 miles, the Boston and Brattleborough, 114 miles, the Albany and Schenectady, 16 miles, the Hudson and Berkshire, 25 miles, the Cattskill and Ithica, 167 miles, the Ithica and Owego, 28 miles, the Amboy and Borden-town, N. J., 30 miles, the Frankstown to Johnstown, Pa., 40 miles, the Baltimore and Washington, 38 miles, and the Charleston and Augusta, S. C., 130 miles long. The terminus of this last road, it should be noted, was at Hamburg, S. C., opposite to Augusta, which is in the State of Georgia.

THE ASCENT OF PICHINCHA.—*La Géographie*, of February 20th, publishes a letter, in which Mme. de Sédières gives an account of the ascent of Pichincha made on the 10th of December last by ten persons, of whom she was one.

Pichincha is a volcano about 11 miles W. N. W. of Quito, in the Western Cordillera of the Andes. It is 100 feet higher than Mont Blanc, but the monarch of mountains is far more difficult to climb. The party from Quito suffered nothing worse than fatigue and cold, both relieved by supplies of Bordeaux and Champagne.

The start from the camp on the lower slope of the mountain was made at three o'clock in the morning.

The night was superb and brilliant with stars, and constellations of the southern and the northern heavens. A halt after an hour gave a view of the sunrise, which came like a flood of gold over the mountains, while the mists below shone like silver. As the horizon broadened with the ascent the circle of glaciers increased till fifteen were counted in view at the same time, and beyond, towering over the lesser summits, rose Cotopaxi and Antisana and Callambe and, far away, Chimborazo.

There was no sign of activity in the crater, which opened fifteen hundred feet deep, streaked from top to bottom with wall-like ridges of black rock. Here and there lay stretches of crystallized snow.

Mme. de Sédières is the only woman who has climbed the peak of Pichincha, and her distinction may last longer than that of some others who have gone up, merely to come down again.

THE BORE OF THE AMAZON.—It will interest Commander Osborne Moore, R. N., whose paper on the bore of the Tsien-Tang-Kiang was noticed in the December BULLETIN, to learn that the water of the Amazon River rises almost as high in the office of the London *Athenaeum* as in Sir Archibald Alison's "History of Europe." The critical journal, reviewing on the 11th January "A History of Bridgwater," mentions the narrow escape of Cromwell and Fairfax, when caught in the bore of the river Parret, in July, 1645, and adds, for general information, that: "The 'bore' in a tidal river is the great wave moving in the van of the oncoming tide, as those who are familiar with the mighty rivers of America know only too well—especially those who are

familiar with the Amazon, whose 'bore' is over a hundred and fifty feet in height."

A RECENT VOLCANIC ISLAND IN THE PACIFIC.—Capt. W. J. L. Wharton, R.N., F.R.S., sends to *Nature*, of January 23d, the following notes, on a matter not hitherto fully reported:

In 1867 H. M. S. *Falcon* reported a shoal in a position in about $20^{\circ} 20' S.$, and $175^{\circ} 20' W.$, or 30 miles west of Namuka Island of the Friendly or Tonga Group.

In 1877 smoke was reported by H. M. S. *Sappho* to be rising from the sea at this spot.

In 1885 a volcanic island rose from the sea during a submarine eruption on October 14th, which was first reported by the *Janet Nichol*, a passing steamer, to be two miles long and about 250 feet high.

The U. S. S. *Mohican* passed it in 1886, and from calculation founded on observations in passing, gave its length as $1\frac{4}{10}$ miles, height 165 feet. The crater was on the eastern end, and dense columns of smoke were rising from it.

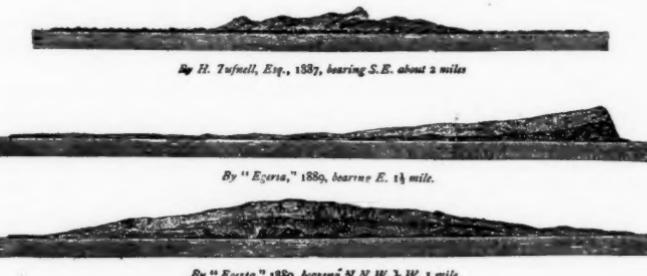
In 1887 the French man-of-war *Decrès* reported its height to be 290 feet. In the same year an English yacht, the *Sybil*, passed it, and a sketch was made by the owner, H. Tufnell, Esq., which is here produced.

The island has now been thoroughly examined and mapped, and the surrounding sea sounded by H. M. surveying ship *Egeria*, Commander Oldham.

It is now $1\frac{1}{10}$ mile long, and $9\frac{1}{10}$ of a mile wide, of the shape given in the accompanying plan. The southern portion is high, and faced by cliffs on the south,

the summit of which is 153 feet above the sea. A long flat stretches to the north from the foot of the hill.

The island is apparently entirely formed of ashes and cinders, with a few blocks and volcanic bombs here and there, especially on the verge of the hill. Under the action of the waves, raised by the almost constant south-east winds, this loose material is being rapidly removed ; continual landslips take place, and Commander Oldham is of opinion that the original summit was some 200 or 300 yards southward of the present highest cliff,



and that the shallow bank stretching to the south represents the original extension of the island.

As far as can be judged from Mr. Tufnell's sketch from the north-west and that of the *Egeria* from the south-south-east, considerable changes have taken place in two years, the different summits shown in the former having disappeared as the sea has eaten away the cliffs. The flat to the north seems to be partly due to redistribution under the lee of the island of the material removed from the southern face. It is crossed by curved ridges from three to twelve feet high, which Commander Oldham considers to have been formed as high

beaches during spring tides and strong winds, the flat ground between them, almost at the level of the water, being deposited under normal conditions of weather. The island is thus gaining on one side, while losing on the other, but when the high part has gone, this partial recovery will probably cease. A little steam issuing from cracks in the southern cliffs was the sole sign of activity, but a pool of water at a temperature of from 91° to 113° F., water which rose in a hole dug in the flat of a temperature of 128° F., and a temperature of 100° F., in a hole dug half-way up the slope, also show that the island still retains heat near the surface. The water is sea water that has filtered through the loose ashes, and it rose and fell with the tide.

It appears by the condition of the flat that the island has neither risen nor subsided during the past two or three years.

It will be interesting to watch the ultimate fate of this last addition to the Pacific isles, but it seems probable that its existence as an island will be short unless a hard core is yet revealed.

The soundings between Falcon Island and Namuka show that they are separated by a valley 6,000 feet deep.

Metis Island, 73 miles north-north-east of Falcon Island, is another volcanic cone that appeared a few years before the latter, but has not yet been examined.

HYPSEOMETRICAL MAP OF EUROPEAN RUSSIA.—At the meeting of the Paris Geographical Society, on the 7th of February, M. Venukoff presented a copy of the hypsometrical map, recently published by Gen. A.

Tillo. This work, which is on a scale of $1/2,520,000$, contains the result of the author's labors for the last fifteen years.

The territory covered is that between the 44th and the 60th degrees of north latitude. The northern portion of Russia in Europe has been omitted, for want of sufficient data; and the Caucasus, already fully represented by orographical and relief maps, has been excluded, because its introduction would have involved the necessity of diminishing the number of tints in the lower parts of the country, so that it would have been impossible to show the relief of Central Russia.

The plan of tinting adopted is the following: The mean elevation of European Russia being 170 metres (557.75 feet) General Tillo has taken this elevation as the dividing line between the low lands and the high lands.

The former are colored green (5 shades), the latter bistre (12 shades). The shades become deeper and deeper as they descend, or rise, from the line of mean elevation at 170 metres. As far as an absolute elevation of 700 metres, equidistant lines are traced at every 10 metres; beyond 700 metres, the lines are drawn at every 100 metres; the figures being approximate in both cases, for the elevations are expressed on the map in *sagenes*, one of which is equal to 2.18 metres.

General Tillo has enumerated on the margin of the map the documents used in its construction; and he has explained in two pamphlets the scientific value of his authorities and the principal orographical results as to the surface relief of European Russia. These results do not agree with the ideas previously entertained on

the orography of the country, but correct them in essential particulars.

FROM PEKING TO KASHGAR.—The February number of the Royal Geographical Society's *Proceedings* has a paper on the Great Central Asian Trade Route from Peking to Kashgaria, an abridgment of a manuscript by Col. Mark S. Bell, R. E., who made the journey of 3,500 miles in 1887. The route is a cart road, that passes through the province of Shansi to the Wei Valley at Si-ngan-fu, and thence through Shensi, Kansu, and the New or Sin-Kiang province of Kashgaria, and Colonel Bell was the first Englishman to travel it in its entirety. Besides this there is the Ala-shan route, across the Little Gobi desert, the one usually taken by camel caravans *via* Kwei-hwa-cheng to Barkul. Kwei-hwa-cheng is the terminus for the Mongolian and Tian Shan camel trade routes, and Si-ngan-fu the Chinese centre for the cart and pack animal routes leading to Kashgaria, Koko-nor, and Tibet.

The road for 218 miles, over the great plain of Chili, was generally in good order.

Beyond this plain, the road passed for 1,400 miles through the *loess* hills. The *loess*, according to Richterhofen, is a solid but friable earth of brownish-yellow color, differing from loam by its highly-porous and tubular structure. The tubes are often lined with a film of lime and ramify like the roots of plants. The *loess* spreads over both high and low ground and its thickness often considerably exceeds 1,000 feet.

The plain of Chili is about 600 feet above the sea, thickly populated and well cultivated. Shan-si, the next

province to the west, is very rich in coal and iron, but does not grow enough grain for its own consumption.

Near the western border of this province Colonel Bell took to the Chinese dress of blue cotton leggings, blouse, travelling cap and spectacles, and so saved himself many a mobbing.

Shen-si, the next province, produces abundance of grain, and for days around Si-ngan-fu, the capital, the traveller passed through one vast wheat-field. Besides wheat, Shen-si exports cotton, cotton goods, tobacco and opium, and receives from Shansi coal, iron and salt, and from Kansu cotton, rhubarb, furs, skins, felts, mules, cattle and sheep.

Si-ngan-fu, which was the capital of China for 2,000 years, is a fine city, with a circuit of eight or ten miles, lofty walls, massive gateways, and walled suburbs. "Withal," says Colonel Bell, "it seems unrivalled for open drains;" otherwise it is a clean city with narrow streets, many of which are paved.

From this city Lan-chau-fu, the capital of Kansu, was reached in twelve days over a difficult hilly country, the road crossing heights of 8,000 and 10,000 feet, and during the greater part of the time being at an elevation of between 6,000 and 7,000 feet. The distance is 449 miles, and the road is at times a fine highway 100 feet wide; at others it narrows to 8 or 10 feet.

This region was devastated during the Mohammedan rebellion, which ended fourteen years ago (written in 1887), and out of 15,000,000 of inhabitants less than 2,000,000 remain. Lan-chau-fu is at an elevation of 5,500 feet, a fine city, with about 40,000 houses, and has a direct trade with Russia.

From the Tibetan border of Kansu there is a gradual ascent to the water-parting and an easy descent beyond to Lhassa in Tibet. This has been excellently described, says Colonel Bell, by Huc, and he adds: "Prejevalski has, I think, too hastily thrown discredit on the works of this talented Jesuit, to the pertinency of whose remarks and to the accuracy of whose observations, whenever and wherever I have been able to test them, I desire to pay tribute."

From Lan-chau-fu the road led north and north-west, following for a considerable distance the line of the Great Wall, often wanting in places, and in the Little Gobi desert but six to eight feet high and a few feet thick. Eighteen miles beyond Su-chau-fu, at Kia-yu-kwan, celebrated as a fortress guarding the extreme north-western entrance into the empire, the Wall came to an end.

Colonel Bell found the Gobi desert much better than its reputation. Water could be readily obtained and was often close to the surface.

From Hami near the northern edge of the desert, at an elevation of 2,650 feet, the road led across the Tian-Shan and then to the west to Hung-Miotza, or Urumtsi, the capital of Sin-Kiang, the new Chinese frontier province formed to include Kashgaria, outer Kansu, Ili, Zungaria, etc., and extending to the Russian border and Mongolia. Here the Chinese have concentrated their chief military strength and are building a city, intended to be an impregnable walled town; but Colonel Bell considers the site indefensible. The town stands in an undulating valley, five to seven miles broad, penetrating the Tian Shan range.

At Toksun Kashgaria was entered, and the route led to the south-west and west, by Karashahar, Korla, Kuchar and Aksu, to its terminus at Kashgar.

In this region the people are largely of Turkish race and Mohammedan. They are well made, the men averaging 5 feet 9 inches in height, and families of five or six children are common. At Kuchar and Aksu the Russian goods were preferred to the English and Indian varieties, and at Kashgar even the Indian merchants retailed the Russian cottons and chintzes.

Colonel Bell's observations led him to the conclusion that a system of railways is a necessity for China, if the Government is to retain its hold on the distant provinces, and to resist the increasing weight of Russia on the frontier.

The Mohammedan rebellion robbed China not only of Kashgaria but of the greater portion of Kansu and of part of Shensi ; and her hold on all these is very loose to-day. At the same time the fact is noted that the Kashgarians are well treated, though they probably would not fight against Russia ; and the admission is made that all the Indians, of whom many are established in Kashgaria, praise the Chinese rule and prefer their new home to India.

Colonel Bell has evidently studied China and the Chinese with a singularly free mind, but his opinions concerning the physical and moral charms of the race would have delighted Denis Kearny and the sand-lot men. "It was pleasant," he says, "to look upon the comely, buxom, good looking Turk woman, after that distressingly hideous deformity of her sex, the Chinese woman." In the bazars of Aksu he was remarked as a

Farangi, *i. e.*, one of a race known as the conquerors of India, and the successors to the inheritance of its Moghul dynasty. None the less, he adds: "A Chinaman or a Mohammedan Chinaman, a class who have retained all the facial and other hateful characteristics of the Chinese, such as pride and impudence, would, however, never fail to equally proclaim that to him I was a *yan-quesah*, a 'foreign devil.' "

TRIVIER'S JOURNEY ACROSS AFRICA.—Africa has been crossed once more, and this time by a Frenchman, Captain Trivier, who left Loango on the 10th of December, 1888, and arrived at Quelimane, December 1st, 1889, accomplishing the feat in less time than any of his predecessors. These were: Silva Porto, Livingstone, Cameron, Stanley (twice), Serpa Pinto, Capello and Ivens, Wissmann (twice), Lenz and Gleerup. Captain Trivier and his two Senegalese attendants were well armed, but had no occasion to use their weapons. At Stanley Falls they were hospitably received by Tippu Tip, whose safe-conduct passed them on to Ujiji, which was reached on the 6th of June. Captain Trivier was ready to leave for Unyamyembe, when his host, the Chief Rumariza, received a letter from Tippu Tip, charging him not to let the Frenchman take the road to the east, because the people in that direction were greatly excited against the Europeans. The route to the north was closed by the Mahdists; the one that led to Masai land could only be forced, Rumariza said, by five hundred good soldiers; and Captain Trivier turned to the south, along the western shore of Tanganyika. He passed the French and English missionary stations,

and met with nothing in the way of adventure until he reached the Nyassa and the Shiré river, in November, two weeks after the encounter between the Makololo and the Portuguese under Serpa Pinto. Their overthrow had filled the Makololo with consternation. M'laoré, the chief who had made the attack on the Portuguese, was in hiding, and his people had deserted their villages. Near one of these Captain Trivier found Serpa Pinto, with his army, which numbered 5,000 men. Besides this land force there were three armed vessels on the Shiré. The Portuguese commander said he meant to clear the river up to the Nyassa and to teach the Makololo a lesson. During the interview the Frenchman said he was eager to reach the coast in order to send a telegram to France. "You can do that here," said Serpa Pinto; "I lay down the wire behind me as I march."

Captain Trivier's letters, from which these details are taken, were sent from Zanzibar to the Bordeaux journal *La Gironde*; but his most remarkable discovery is reported in *Le Figaro*, of March 1st, in these words: "As for the famous Congo Free State, M. Trivier does not know what to think of it. It is said that this Company, created by the Belgian State itself, not being able to undertake openly the trade in ivory, makes use of the American cloak to cover its commercial operations."

There is always something new out of Africa, and Captain Trivier may fairly boast of having distanced probability and common sense, as well as his predecessors. It is strange that, with *Le Figaro* to help him, he forgot to show that the resignation of Bismarck

would be the natural consequence of Tippu Tip's policy at Stanley Falls.

MUTILATION OF MONUMENTS IN EGYPT.—Lieut.-Col. J. C. Ross, Inspector-General of Irrigation, Egypt, writes to the London *Academy*, of February 8th, that "some fiend has been secretly destroying some of the most interesting monuments of middle Egypt." Name-ovals and inscriptions have been cut from the tombs of Ameni and Khnum Hotep and Der-el-Barsha; and the head of the celebrated Colossus on a Sledge has been destroyed in the fresco at Der-el-Barsha.

Colonel Ross adds: "It is evident from the objects selected for removal that the spoiler is directed by some European agent; and I write this to put Egyptologists on the alert, so that if the face of the Colossus or the stolen cartouches are found in any European or American museum you may hold its curator up to the execration of the scientific world."

Execration, and even more than that, the supposed curator and his assistant fiend do, indeed, richly deserve; but there is no great difference in principle between the spoliations practiced by their methods, and those carried out with order and decency, and on a larger scale, for the decoration of New York and London.

Prof. A. H. Sayce in the *Academy* of March 1st, is even more emphatic than Lieut. Col. Ross. "This letter," says Mr. Sayce, "ought to be headed 'The Destruction of the Ancient Monuments of Egypt.'" The tax of 100 piastres imposed a year and a half ago upon every person who wished to visit the great monuments of Upper

Egypt, produced, according to Mr. Sayce, more than £1,000 last year, but not a farthing of the money seems to have been applied to the protection of the monuments, the purpose for which the tax was levied. On the contrary, more havoc has been wrought during the last three months than during the whole of the last half century.

If destruction goes on at such a rate when the hands of the Khedive's government are strengthened by the support of the English, what would become of the monuments if Egypt were left to take care of herself, as in the days of Mehemet Ali?

The editor of the *Academy* notes the fact that the Government, when questioned in the House of Commons concerning this matter, had "received no such information"; and mentions also that the *Times* of February 21st contained a letter from Dr. Jex Blake, complaining of the mutilation of the tomb of Knum Hotep at Beni Hassan, and adding that he was informed by his dragoman that "the outrage was committed, within the last three months, by a German." The dragoman, being an intelligent person, knew that the outrage could not have been the work of an Englishman; but it does not appear why he was led to make the offender a German, rather than a Dane or an Italian. With the help of this keen interpreter it may be possible to explain some of Mr. Flinders Petrie's doings in the Fayum.

Dr. Schweinfurth, who writes (in Petermanns Mitteilungen, 36 Band, II) with great approbation of Mr. Petrie's labors and of the conclusions reached by him, condemns with severity the method, or lack of method, employed in the excavations. By the terms of the concession for the

work, a selection of the articles found was delivered to the Egyptian authorities. The remainder was for the English and might be regarded, in the words of Maspero, as saved. Much of it, however, went to ruin by wind and weather and the pressure of the quantity collected ; for, says Dr. Schweinfurth, it must be told without circumlocution that Flinders Petrie paid no particular attention to his technical outfit. He had no tent and no boxes, and many a little object of priceless value was swept away by the wind, or carelessly trodden out of shape in the desert sand. For the fragile and easily crushed articles, and especially for the remains of plants and for vegetable fibres, no envelope could have been more unfit than the mummy wrappings, so conveniently at hand. In order to get at anything that was new, Mr. Petrie went through his work in a very summary fashion, and destroyed where he ought to have secured.

Dr. Schweinfurth's remarks should be pleasant reading for the subscribers to the Egypt Exploration Fund.

THE RAIYĀN MOERIS AND THE SILSILEH PROJECT.—In January last the Egyptian Government sent Mr. W. Willcocks, Inspector of Irrigation, to Wadi Halfa with instructions to report upon the possibility of storing Nile water to the south of Gebel Silsileh. Mr. Willcocks has returned to Cairo, and reports that both the Silsileh and Kalbusha projects are utterly impracticable.

Sir C. C. Scott-Moncrieff says that the Raiyān project is the only scheme which the Egyptian Government has to consider. It must, therefore, be put in hand at once, in spite of Mr. Flinders Petrie's dictum, quoted with reserve by Dr. Schweinfurth in *Petermanns Mitteilungen*

(36 Band, II), that he "most positively denies the existence of a Lake Moeris, as understood by Cope Whitehouse, because there never could have been, in historical time, any communication between the depressions of the Raiyān and Moële and that of the Fayum."

Historical time has covered and will cover a number of rash assertions. Leaving the past to take care of itself, the engineers, who have the Raiyān storage lake in charge, will be stimulated in their task by the complete success which has attended the restoration of the great French work, the Barrage.

PORtUGUESE EXPLORATIONS IN AFRICA DURING THIS CENTURY.—The *Journal of the Manchester Geographical Society*, Vol. 5, Nos. 4-6, takes from the British Association Reports for 1889 a sketch, made by Mr. J. Batalha-Reis, F. R. G. S., of the work done by the Portuguese, since the year 1802, in the exploration of southern Africa.

This work has passed without recognition for two reasons: Portugal is not a Great Power, and the Portuguese write in their own tongue, which is very little read by men of other nations. These reasons, unworthy as they are, will continue to have their influence on general opinion, but the Portuguese must always resent the gross assumption, too frequent in English and American publications, that Portugal is to receive lessons in morality from some other Power.

Mr. Batalha-Reis's article is as follows (spelling unchanged):

"From the fifteenth century to the present time the Portuguese have not ceased to explore those parts of

Africa where they settled, causing the continent to be traversed from the coast to the interior, and from the Atlantic to the Indian Ocean. Outside Portugal the greater part of the Portuguese explorations of the nineteenth century are entirely unknown. Many geographers and the public in general believe, and repeat daily, that Portugal has done nothing in Africa since the sixteenth century, and that even then her travellers explored only the African coast. As ignorance regarding the chapter of geographical history is the origin of many and great mistakes in modern questions which are linked up with politics and international right, and with which public opinion is so intensely preoccupied just now, I judge it to be opportune to present an indication of the principal Portuguese explorations, at least, from the beginning of the nineteenth century, with the mention of the principal documents wherein the little-known literature of the subject may be studied. The chief Portuguese explorations of this century commence with its earliest years. In 1802 the expedition sent out by Colonel Honorata da Costa from Angola, which traversed the whole of the continent from the basin of the Kassai to the basins of the Lualaba, Luapula, Bangweolo-Bemba and North Loangwa, arrived at Tete in 1811. In 1804 and 1805 Father Cannecatim published his dictionary and remarks upon the Bunda, or Angolense, language, and the narrative of his journeys in Africa. In 1831-1832 Monteiro and Gemitto explored the region between Lakes Nyassa, Bembo-Bangweolo, and Moero and the River Zambeze. In 1838-1848 Major Francisco J. Coimbra made his journey from Mozambique to Benguella, across Africa, and visited the

lakes to the north of Kalaari. In 1843-1847 Joachim Rodrigues Graça went from Golungo to Bié, and thence to Lunda, almost at the eastern extremity of the basin of the Kassai. For many years Silva Porto travelled and explored the territories between the valley of the Kwanza and that of Liambye on the Upper Zambeze. In 1852-1856 his expeditions travelled from the Upper Zambeze to the Upper Luangué, and between the basins of the Zambeze and of the Congo, passed to the south of Nyassa, and crossed, diagonally, the region between the Nyassa, the Rovuma, and the sea. In 1855-1856 Montanha and Teixeira explored the territories between Inhambane, the Limpopo, and the north of the Transvaal. In 1877 expeditions of engineers were sent by the Portuguese Government to all their colonial provinces of Africa, and instituted the investigations and works which have gone on up to now and from which the first railways in these regions had their commencement, the more perfect knowledge of many of the regions being also due thereto. In 1877-1878 Serpa Pinto crossed the continent of Africa from Benguella to Bié, and thence by the affluents of the Kwando, to the Upper Zambeze, thence to the lakes north of Kalaari, thence through Bechuanaland to the Transvaal and Natal. In 1877-1880 Capello and Ivens went from the valley of the Cunene to the valley of the Kwanza and thence to that of the Kwango, which they investigated nearly as far as lat. 6° S.

In 1883, Antonio Cardosa visited the districts which lie between the river Save and the upper valleys of the river Buzi. From 1880 Paiva d'Andrade has been exploring the lands which lie between the Zambeze and

the valleys of the Save and Buzi. In 1884-1885 Capello and Ivens travelled right across Africa from Mossamedes to the rivers Cunene, Cubango, Liambye, Lualaba, Luapula, Lake Bemba, and thence to the Zambeze, from near the mouth of the Kafue to the sea. In 1885-1886, Augusto Cardoso traversed from Ibo to the Nyassa, and thence by the Shiré to the Zambeze. In 1884-1888, Henrique de Carvalho and Sisenando Marques investigated the territories between the Kwanza and the Kassai in the districts of Lunda. These are the better known travels, but the Portuguese have undertaken very many less extensive but more minute explorations than these, which are almost entirely unrecognized, and cannot be mentioned in a brief abstract. They have thus covered with a work of uninterrupted investigation, from the sixteenth century up to the present time, almost all the more important regions of Africa which can be found between a line drawn from the mouth of the Congo to that of the Rovuma, and from that of the Cunene to the south of that of the Limpopo. Many explorations, exclusively scientific, more limited, and more delayed in their results, have been and still continue to be carried on. It was under the Portuguese Government that Welwitsch made his investigations and botanical collections in Angola (1853-60), which are amongst the principal bases of all that has been published on the Tropical African flora. In 1864-65, Pinheiro Baiaõ collected important zoological specimens in the districts between the Lucala and the Bengo in Eastern Africa, as did the two missionaries, Father Antunes in Huilla, and Father Barrozo in the Congo district. From 1864 José d'Anchietta has resided in the interior of

Africa, and thence has sent the notable investigations and magnificent collections, for the most part zoological, which so enrich the Natural History Museum of Lisbon (Escola Polytechnica), and which, in part, have been studied by Professors Bocage (reptiles, birds, mammalia), J. A. de Sousa (birds), Felix Capello, Guimarens, Osorio (fishes and crustacea), Mattoso dos Santos (myriapoda), M. Paulino de Oliveira, A. Girard (insects), Count Ficalho (flora), etc., not to mention other than the principal Portuguese *savants*. From the said Anchietta are some recent geological researches upon the Angola formations; and upon his collections, those of L. Malheiro (1883), and those of other travellers, the investigations of Delgado, Choffat, and other geologists of the Lisbon Geological Commission have been founded. The principal and less known sources whence to study recent Portuguese explorations are: "Boletim e annaes do Conselho Ultramarino, Annaes maritimos e coloniaes;" "Annaes da marinha Portugueza;" "Boletins officiaes da Provincia de Angola;" "Boletins officiaes da Provincia de Mozambique;" "Boletins (and other publications) da Sociedade de Geographia de Lisboa;" "Journal das Sciencias Mathematicas e Naturaes da Academia das Sciencias de Lisboa;" "Boletim (and other publications) da Comissão dos Trabalhos geologicos de Portugal;" "Memorias estatisticas das Colonias Portuguezas," by Botelho, Lopes Lima, Bordalo;" "As Colonias Portuguezas," etc.

KILIMANJARO.—Dr. Hans Meyer, who was baffled in his first attempt to climb the great African mountain, renewed the effort with complete success in October

last. He writes, in a letter printed in *Petermanns Mitteilungen, 36 Band, I*: "Purtscheller and I have climbed, in two ascents, to the highest point of Kibo, and solved the riddle of its crater;" and he has since described his adventures to the Berlin Geographical Society.

On this second expedition Dr. Meyer went provided with every aid that Alpine experience could suggest, and accompanied by Mr. Purtscheller, an Austrian, thoroughly at home among glaciers and mountain peaks. Two camps were established on the mountain, and a tent was pitched for headquarters on the "saddle-plateau," a little more than 14,000 feet above the sea. Provisions were brought to this point regularly from the lower camps, and Dr. Meyer acknowledges that, but for the help of the Pangani negro, Muini Amani, who cared for all their physical wants, it would have been almost impossible for them to hold out. Muini Amani was not their only African friend, and Dr. Meyer says very good things of a model black prince, the "amiable young Mareale," of Marangu.

For a belt of 3,000 feet in width below its middle, Kilimanjaro is covered on the south and east with unbroken forest, but the northern side is bare, except for bushes and grass.

The start for the crater was made between 2 and 3 o'clock in the morning with lanterns, for the night was pitch dark; and when, after groping and struggling over rocks and ice, the travellers reached the crater's edge, they saw that the highest part of the mountain lay to their left, and that they could not reach it in less than an hour and a half. The height at which they stood

was 5,800 metres (19,028 feet). After resting a day or two, they attacked the mountain on the other side, and climbed every one of the three points into which the summit was there divided, and found that the one in the middle was between 15 and 20 metres higher than its neighbors. At a quarter past ten o'clock A. M., on the 6th of October, Dr. Meyer stood on this, "probably the highest point of German land," planted the German flag, and named the peak, "Kaiser Wilhelm-Spitze." It is 6,000 metres (19,685 feet) above the sea.

The crater of Kilimanjaro is circular, about 6,500 feet in diameter, and nearly 700 feet deep. At the bottom is a glacier, formed and supplied by ice and snow, and with an issue through a gap in the western wall of the crater. From this glacier flows the Weri-Weri river.

SIR HENRY YULE.—The death of Sir Henry Yule, on the 30th of December, 1889, is an irreparable loss to geographical literature. He had been in failing health for many months, and he was in his seventieth year, but his latest work showed no abatement of his powers, and it must be felt that he has died before the fulness of time.

Henry Yule was born on the 1st of May, 1820, at Inveresk, near Edinburgh. He went to India in 1840, served in the Punjab and in Burma, and accompanied Sir Arthur Phayre on a special mission to Ava. During the Indian Mutiny he was engaged on defensive works at Allahabad, Benares, and Mirzapore. He retired from the army in 1862, with the honorary rank of colonel, and was appointed, in 1875, a member of the

Indian Council. This position he resigned in the summer of 1889.

Colonel Yule was an indefatigable student and writer, especially devoted to the history and geography of Asiatic countries. Two of his works, "Cathay and the Way Thither," and "The Book of Ser Marco Polo," will always hold their ground, and of the Marco Polo it is not too much to say that no work of research and illustration in a similar field can be brought into comparison with it.

Equally remarkable for curious and recondite learning of another kind is the "Glossary of Anglo-Indian Terms," collected by Colonel Yule, with the aid, for a portion of the book, of Mr. Burnell.

This was published in 1886, and in the next two years appeared the three volumes of his last work, the "Diary of William Hedges," a Bengal merchant of the days when Englishmen had hardly begun to dream of an Oriental empire.

Two days before his death he was informed by telegraph of his election as a corresponding member of the Académie des Inscriptions et Belles Lettres. His brief reply, in Latin,* is marked by a pathetic dignity and serenity of spirit: "I return thanks, most eminent sirs, for honors as much too great as they are undeserved. My strength leaves me, my life is failing, take, therefore, the will for the deed. A dying man, with a full and most grateful heart, bids you farewell."

**Reddo gratias, illustrissimi domini, ob honores tanto nimios quanto immeritos. Mihi robora deficiunt, vita collabitur, accipiatis voluntatem pro facto. Cum corde pleno et gratissimo moriturus vos, illustrissimi domini, saluto.*

Publication du Ministère de la Marine. Mémoire sur l'Abolition de l'Esclavage et de la traite des noirs sur le territoire portugais.

Lisbonne, 1889.

(from the Portuguese Minister at Washington.)

This pamphlet of 100 pages is a temperate statement of facts concerning the attitude and the legislation of Portugal on the subject of African slavery. The reader is reminded, at the outset, of two points, much too frequently overlooked: that no white race is responsible for the existence of slavery in Africa, and that it was natural the first white slave-traders should be Portuguese, since Portugal was the first European Power to make discoveries along the African coast.

Like every other civilized nation, Portugal made gradual approaches to the idea of the wrong of slavery, but justly claims the distinction of having been the first to legislate on the subject. By successive decrees of March 20, 1570, Nov. 11, 1595, July 26, 1596, June 5, 1605, July 30, 1609, and Sept. 10, 1611, the Government forbade, in the name of the law of nature, the traffic in the natives of Brazil, and proclaimed them *free and equal to other men*. That precept and practice should have gone so far together and no farther may be a reproach to the Portuguese, but no other nation is in a position to make it. England has surely a right to be proud of her efforts in the present century for the abolition of African slavery; but how long is it since slaves were advertised for sale in the Liverpool papers, and what is the right English word for negro apprenticeship?

In 1835 Spain prohibited the slave trade under the Spanish flag, and in 1842 Portugal conceded the right

of search to the English cruisers. It must be remembered that Cuba and Porto Rico and Brazil offered the only markets to the slave-dealers, and it was, therefore, no more than natural that these should be for a long time Portuguese, or men of all nations sailing under the Portuguese flag. The importation into Brazil was forbidden in 1850, but the enormous profits tempted the traders to run the risk of capture. The English cruisers were the most active in the suppression of the trade, but the Portuguese did their part. The present pamphlet gives a list of 122 slavers captured by the Portuguese authorities in the fifty years from 1837 to 1888, on both coasts; and, taking into account the difference in the disposable forces of the two nations, England and Portugal, the lesser Power has no reason to be ashamed of the record.

It is often said that Portugal has not suppressed the slave-trade in her African colonies, nor among the tribes of the interior within the sphere of her influence, to use the phrase just now so much in favor. To this the Ministry of Marine and the Colonies makes answer that the suppression of the slave-trade in Africa is a task only to be accomplished in a long course of time, and remarks that even England, with all her sentiments of humanity and the great organization at her command, has not been able to destroy the slave-trade at Zanzibar, nor, according to trustworthy evidence, in Egypt, which is, perhaps, more directly within the sphere of her influence than South Central Africa is within that of Portugal.

It might have been added that Portugal has made no provision in any recent treaty like that in the convention

between England and Italy for excepting from search by the cruisers of the two nations, *in the Mediterranean Sea*, vessels supposed or reported to have slaves on board.

Among Cannibals: an Account of Four Years' Travel in Australia, and of Camp Life with the Aborigines of Queensland. By Carl Lumholtz, M. A. With Maps, Colored Plates, and 122 Illustrations.

London, 1889.

Mr. Lumholtz spent a year, from August, 1882 to July, 1883, in the valley of the Herbert River, which empties itself into the Pacific Ocean at about 18° S. Lat., among a race of people, whose culture, if they can be said to have any, must be characterized, he says, as the lowest to be found among the whole genus *homo sapiens*. Many of the Australian aborigines are cannibals, and most of the tribes have not yet emerged from the Stone Age in the history of their development. It has been Mr. Lumholtz's purpose to present in his book a faithful picture of the life, manners and customs of these aborigines from their birth and infancy to their old age and death; and thus to rescue, for the science of ethnography, facts concerning tribes that have never before come into contact with white men, and that within a generation or two will have disappeared from the face of the earth.

The more closely his book is examined, the more it is felt that Mr. Lumholtz has thoroughly accomplished his purpose, with a conscientiousness that seems nothing less than heroic to the reader; for of the native Australians, if of any men, it may be said in the words of the

English captain's report, that manners they have none, and their customs are beastly.

Nor was it only the disgust at the contact with such beings, offensive to every sense of the civilized man, that had to be faced ; the explorer's life was in continual danger.

The first caution impressed upon Mr. Lumholtz by the colonists was never to allow a black fellow to walk behind him. He was frequently in peril, not from strange blacks, but from the men who lived with him day and night and to whom he had shown all possible kindness. The natives were no less treacherous to each other than to the white man, and there is very little sign in the record of Mr. Lumholtz's experience of anything like a moral idea among them, with the single exception of their kindness to the sick, who are carried by their comrades from camp to camp.

There is a belief among them of the soul's existence, independently of matter, and a wide-spread fear of the spirits of the dead, though there is no dread of the spirits of those long since departed. It has happened that the savages have supposed white men to be their own deceased fellows ; and this seems to imply a belief in a future life.

No ideas of divinity are attached to the sun or the moon. On one occasion, when the full moon rose over the palm forest, Mr. Lumholtz pointed to it, and asked his men : "Who made it?" They answered : "Other blacks." The same answer was returned when he asked who made the sun. He found no trace of myth or legend among the blacks of Herbert River ; but they were close observers of the starry heavens, and he

was surprised to find that they had different names for the planets.

In other parts of Australia the natives have imagined some very strange and beautiful myths of the stars. The Herbert River savages seem to believe in a demon, though Mr. Lumholtz was unable to get a definite account of this being. None of the Australians practice idolatry or offer sacrifice, and they have not been known to pray.

Mr. Lumholtz made extensive zoological collections and brought home, besides reptiles and batrachians, fishes, and insects, 700 specimens of birds. He discovered also four new mammals, viz. : three opossums and the tree-kangaroo, *Dendrolagus lumholtzii*, named for him by Professor Collett.

It ought to be said that "Among Cannibals" is one of the most interesting and valuable of recent contributions to the literature of travel and exploration, and that the author's English, for which he asks the indulgence of his readers, may stand upon its merits.

Around and About South America, Twenty Months of Quest and Query. By Frank Vincent. With Maps, Plans and Illustrations.

New York, 1890.

(from the Author.)

In this volume Mr. Vincent has aimed "to grasp salient features and emphatic characteristics, and to delineate them with a careful conciseness that shall beget a correct and lively general impression;" and it must be admitted that he succeeds in interesting his readers.

He tells his story in a straightforward way, bringing in, without any attempt at fine writing, the scenes and the incidents that attracted him. He visited the capitals, the chief cities and the seaports of all the South American countries, made expeditions into the interior of Brazil and the Argentine Republic, and ascended the Paraná, the Paraguay, the Amazon, the Orinoco, and the Magdalena. Not many men can hope to see more of a great continent, or to enjoy more thoroughly what they see, than Mr. Vincent does. He is frequently stirred to eloquence, as in describing the sunset view of the Andes from the harbor of Valparaiso: "The clouds lay lightly upon parts of the range, but Aconcagua towered apparently twice as high as the others, quite above the clouds, solitary, peaked, and serrated. . . . As the sun dropped into the dark ocean, the mountain range, the earth whence it arose, and the firmament into which it soared, combined to form a most enchanting spectacle. The jet black of unlit peaks, low down, contrasted with the brilliant purple of illuminated ridges, higher up, and these, again, with the vast snow-fields, changed into a sea of flame by the expiring rays."

Mr. Vincent has a great admiration for Dom Pedro II. (to whom the book is dedicated) and for Guzman Blanco, and he takes the statues of the latter, in and about Carácas, for genuine tributes of affection and respect from the hero's countrymen. It is not only in Venezuela that Mr. Vincent falls into the sin that doth so easily beset the tourist. He utters himself on matters political and social in every South American country with more confidence than knowledge. He speaks of the "demon of assassination always hovering" over

South American presidents ; but of what country were Lincoln and Garfield ?

He has a gift for inaccuracy, as well as for wild statement. The Peruvian *sol*, he says, is worth five cents, or about one-fourteenth of its real value ; the first island discovered by Columbus was Watling Island, though Mr. Vincent is the only man who can be sure of it ; and in the crypt of the Cathedral of Lima he finds the embalmed remains of the great Francisco Pizarro, " transferred from the old cathedral, which was built on the same site in 1607 by the valiant *conquistador* himself ;" who was killed, strangely enough, in 1541.

What Mr. Vincent calls "the most important, as it was certainly the most interesting, event" of his entire tour, was the exploration of the "Daly Falls," on the Iguazú river, twenty miles from its junction with the Paraná. To quote his own words : "Several of these falls have, at various times, received local titles other than the 'Falls of the Iguassu' (*sic*), but no specific name, recognized in maps or books, has ever been given them, notwithstanding that they are almost rivalled farther up the river. I therefore assume the explorer's privilege of naming them Daly Falls, in honor of Charles P. Daly, LL. D., the learned and genial President of the American Geographical Society."

The great Fall of the Iguazú has been known for at least a hundred years by the name of the Salto de Victoria,* and Mr. Vincent has assumed a good deal of privilege for a very little exploration.

* Se le dió el nombre Victoria (y no de la Victoria) porque los primeros españoles, venciendo mil dificultades, salvaron ese salto. (Mariano Felipe Paz Soldan, Diccionario Geográfico Estadístico Nacional Argentino, Buenos Aires,

He must have made other discoveries during his long journey, and he ought to have given, at least, a new name to the Rio de la Plata, or to the city of Buenos Aires.

Carte de Madagascar, par E. Laillet Ing^r et L. Suberbie, Explorateurs de l'Ile, d'après leurs documents personnels complétés à l'aide des cartes de la marine et les itinéraires suivis par divers voyageurs.

Paris, Challamel et C^{ie} 1889.

(from the Authors.)

This map is in three sheets, on a scale of 1 : 1,000,000, and is a beautiful specimen of cartography. For the coasts the authorities are the French Marine charts for the northern part of the island, and the charts of the English Admiralty for the southern portion. The soundings are given in metres, at the level of low water.

For the interior of the island Messrs. Laillet and Suberbie have made their own explorations, without disdaining the help afforded by the work of others. Even with this help their map must be regarded as a sketch, and a contribution to the future map of Madagascar. As M. Gabriel Marcel has pointed out, in the *Revue de Géographie*, for January, it is only the province of Imerina that has been surveyed according to scientific methods; a space, that is to say, of less than 10,000 square miles, or about one twenty-third part of the whole country.

1885 ; p. 447.) "The name Victoria (and not de la Victoria) was given to it, because the first Spaniards, after surmounting a thousand difficulties, passed over that fall."

The details of the map do not inspire confidence. The names, with which the east central region is crowded, appear in some instances to have lost their way, and to be without earthly ties. A little to the N. W. of Tananarive are Antaramanana and Ambohimanga, of which it is impossible to say whether they are meant for villages, or rivers, or mountains; and Ambohimena and Anzavona, farther to the north, are in the same friendless condition.

The elevations marked, even if not absolutely correct, cannot be greatly in error, and they are not lavished; but some of the legends might have been omitted with advantage. It does not give much light to read in one place without sign of habitation: "Many settlements of intelligent people"; and in another stretch of country: "Fragments of *epyornis* eggs."

A very high value is set upon the work of Messrs. Laillet and Suberbie in an *Essai sur la Cartographie de Madagascar, par M. de Bassilan, Paris, A. Challamel, 1890.*

This essay assigns the oldest map of the island to *Edrissi*, in the year 1153.

Next to him comes, in the year 1300, *Hereford*, who "vaguely indicates on his map the position of the island." This vagueness is the more reprehensible that Hereford is a cathedral, and ought to have set an example of high regard for the truth.

Ruich, who is generally known as Ruysch, did very little better in 1508 than Hereford two hundred years before, and there is not much to be said, it seems, for any of those who preceded Messrs. Laillet and Suberbie.

An interesting account of the patriotic and political

services of these gentlemen occupies about half of M. de Bassilan's essay, but does not lend additional weight to the authority of the map.

Divisions, Subdivisions, Langues et Races des Régions Amhara, Oromo et Sidama, Communication faite par Jules Borelli à la Société de Géographie de Paris.
(From the Author.)

M. Borelli, whose explorations in Shoa earned for him the gold medal of the Paris Geographical Society, presents in this Memoir the results of his observations in the regions named during the years 1885-1888. These results are classified and stated with great conciseness.

The Amhara, Oromo and Sidama countries have no precise limits, other than those of language. The regions in which the Amhara tongue is spoken are called by the collective name of Amhara; the Oromo are those in which the language is Oromo, and Sidama is the name given to the districts in which the speech is neither Oromo nor Amhara.

M. Borelli thinks it very probable that all the populations of Eastern Africa, north of the Equator, came from the first Semitic races that crossed the Red Sea from Asia, and that the existing distinctions are varieties resulting from intermixture with the negroes.

A description of the basin of the Omo and its mountains, the highest of which, the May-Goudo, attains an elevation of 11,150 feet, is followed by vocabularies of the Koullo, Tambaro and Hadia tongues; and a tabulated summary of levels, altitudes and astronomical observations fills the final sixteen pages of the memoir.

TITLES OF PAPERS IN GEOGRAPHICAL JOURNALS.

BRUSSELS.—*Le Mouvement Géographique.*

Geographical Discoveries of the Stanley Expedition—Second Letter from Stanley—Ascent of Ruwenzori—Copper Mines of M'Boko Songho—Missions of the Congo Region—The Exploration of the Mongala River—M. Dupont's Book on the Congo—The Anglo-Portuguese Conflict—The Congo Railway—From the Niger to the Gulf of Guinea (Captain Binger)—Belgian enterprises on the Congo—The Exploration of the Lomami by Gov.-Gen. Janssen—The Loképo Exploration (Lieutenant Bodson).

EDINBURGH.—*The Scottish Geographical Magazine.*

Anniversary Address—Africa; British and other Spheres of Influence, by General Sir Lewis Pelly, K.C.B., K.C.S.I., M.P.—Letter from Mr. Henry M. Stanley to the Royal Geographical Society of London and to the Royal Scottish Geographical Society—The Kara Sea and the Route to the North Pole, by Capt. A. Hovgaard, Danish Navy—The Evolution of Climate, by Prof. James Geikie, LL.D., D.C.L., F.R.S.—The Physical Basis of Political Geography, by H. J. Mackinder, M.A., Reader in Geography, University of Oxford—Around and About Armenia, by Col. Mark S. Bell, V.C., A.D.C., R.E.—The Wall of Derbend, by the Hon. John Abercromby—The State of the Active Sicilian Volcanoes in September, 1889, by H. J. Johnston-Lavis,

M.D., M.R.C.S., B.Sc., F.G.S.—The Kirghis and Kara-Kirghis.

GENEVA.—*L'Afrique Explorée et Civilisée.*

Monthly Bulletin—Chronicle of Slavery—Stanley and Emin—The Latest Discoveries of Stanley.

GOTHA.—*Petermanns Mitteilungen.*

Ethnography of the Peloponnesus—Dr. K. W. Schmidt's Travels in the Western Comoro Islands—The Ascent of Kilimanjaro—Report on Posselt's Journey to Simbabwe (Matabele-land)—The Berbers of Morocco—Binger's Journey to the Ivory Coast—An Important Indian Treaty (for cession of lands in Northern Minnesota)—New Map of the Balkan Peninsula (Stieler's)—The Ugueno Highland and Western Kilimanjaro—Flinders Petrie's Excavations in the Fayum—New Map of Italy (Military Geographical Institute, Florence)—The Population of Greece—Earthquakes in Greece and Turkey in 1889.

LISBON.—*Sociedade de Geographia de Lisboa, Boletim.*

In Cubango (South Central Africa)—A Campaign in Bire—Relations of Portugal with Siam and Alliances of this Country with Foreign Powers—Campaigns in the Region of the Zambezi—The Cutting of the Isthmus of Panama in the XVI Century.

LONDON.—*Royal Geographical Society, Proceedings.*

The Bahrein Islands in the Persian Gulf—Progress of the Russian Expedition to Central Asia under Colonel Pievtsoff—The Great Central Asian Trade Route from Peking to Kashgaria

—Mr. J. R. W. Pigott's Journey to the Upper Tana, 1889—The Chinde River and Zambezi Delta—A Recent Journey in Eastern Mashona Land—A Journey through the Country lying between the Shire and Loangwa Rivers—A Visit to the Newly Emerged Falcon Island—The Russian Expedition to Central Asia under Colonel Pievtsoff.

MADRID.—*Sociedad Geográfica de Madrid, Boletín.*

Memoir on the Geographical Progress of the Year (D. Martín Ferreiro)—Ethnographical Vademecum of the Philippines (Blumentritt)—The Books of Columbus—An Unpublished Atlas of Juan de Oliva, 1592 (D. Cesáreo Fernández Duro)—The Province of Nueva Écija, in Luzon (D. Joaquín Rajal)—A Prehistoric Monument: The Statues in the Valley of San Agustín, in Colombia—Magnetic Determinations in the Western Mediterranean—On the Mean Level of the Sea (M. Ch. Lallemant).

MANCHESTER.—*Manchester Geographical Society, Journal.*

Some Impressions of Morocco and the Moors (Jos. Thomson)—Prehistoric Chat Moss, and a New Chapter in the History of the Manchester and Liverpool Railway—Florida and the English—On the Teaching of Elementary Commercial Geography in Primary and Secondary Schools, and in a Minor Degree of Elementary Technical Instruction—Taranaki—Indian Railways and

British Trade—Cree Indians of Calgary—The Snow line of the Tatra Mountains.

PARIS.—*Société de Géographie, Compte Rendu.*

Geographical Notes on Russia, by M. Venukoff—Paul Venukoff's Excursion in the Mougodjar Mountains (Western Asiatic Russia)—The Explorer Camille Douls—Uganda and the Victoria Nyanza—Hypsometrical Map of European Russia—A Feudal Colony in America (French Canada)—Fourneau's Travels in the Ogowe Country—Nordenskiöld's Proposed Antarctic Expedition—Growth of the Neva Delta—The Tuareg Vistors to Paris—The Ascent of Kilimanjaro—The Unification of Time.

Bulletin.

From the Niger to the Gulf of Guinea, by way of Kong (Capt. L. G. Binger)—Cunani and the Mapa River (H. Coudreau)—From Seoul to Quelpaert and back by way of Fu-san, Wonsan and Vladivostok (Chaillé-Long)—Basque Ethnography (H. de Charencey).

ROME.—*Società Geografica Italiana, Bollettino.*

Alvarez's Ethiopia—The Columbus-Toscanelli Letters and the Danti—Rivers, according to the Doctrines of Present Geographical Science (Prof. Porena)—Dr Ragazzi's Letters to the President of the Italian Geog. Society—Nerazzini's Abyssinian Itinerary—The Torrid Zone and the Cosmopolitanism of Man—Studies for the Columbus Collection—Letter of Baron C. Negri on Peru and Italian Science—Tiet-

kens's Explorations in Central Australia (Tr.)—Mercator and his Maps, a Memoir by Prof. M. Fiorini.

VIENNA.—*Mittheilungen der K.-K. Geographischen Gesellschaft.*

Montenegro—The Mountain Tribes of the Negros Island (Philippines), by Blumentritt—Ice peaks and Glaciers in the Sexten Dolomites (Tyrol)—The African Journey of Count Teleki—The International Geographical Congress of 1889—The Colossal Globe on the Champ de Mars, in Paris—The Provinces of Shirvan, Chisan and Tatik—The Present Position of Official Cartography in European States with especial Reference to Topographical Maps.

WASHINGTON LETTER.

WASHINGTON, MARCH 19, 1890.

CONFERENCE OF AMERICAN NATIONS.—The Conference of American Nations which began in January is practically at an end. Although newspaper reporters and the public were not accorded attendance, it is understood that a vast amount of valuable information was gathered, and that the discussions, as might have been expected from the distinguished composition of the body, were of a very high order.

It will not be a difficult matter to summarize the conclusions of the conference. Reports have been made and adopted on the subjects of railroads, weights and measures, sanitary regulations, international law, patents and trade marks, arbitration, steamship lines, etc. As to coinage there will hardly be an agreement, because the South Americans favor unlimited coinage and the United States membership on the committee is divided, Mr. Estee of California favoring unrestricted silver coinage, and Mr. Coolidge of Massachusetts opposing it. More discussion and longer sessions have been devoted to the consideration of a customs union than to any other subject. The difficulty in agreeing to a report is due to the rival interests of the nations concerned. The Spanish-American governments derive their revenues from taxing imports and exports. They levy duties on all we send them, while we admit free 80 per cent. of what we get from them. Certain articles, such as flour,

provisions, clothing, petroleum and lumber, which those countries do not produce, they are willing to admit duty free or for large reductions if we, in return, admit free their sugar and carpet wool. The United States member, Mr. Henderson, is willing to concede free sugar but not free wool. The majority of the committee believe that the principle of unrestricted reciprocity is acceptable, and that its adoption would, in all probability, bring about as favorable results as those obtained by free trade among the different States of this Union. A customs union on this basis, however, they deem impracticable as a continental system, at present. But if it is not easy to arrive at once at unrestricted reciprocity, that end might be gradually obtained. The first step in that direction is the negotiation of partial reciprocity treaties among the American nations, whereby each may agree to remove or diminish its respective import duties upon some of the natural or manufactured products of one or more of the other nations in exchange for similar and equivalent advantages. If good results should follow, the number of articles on the free list might be enlarged from time to time. Therefore the majority proposes ; "To recommend to such of the governments represented as may desire partial reciprocity, to make commercial treaties with one or more of the American countries, upon such a basis as may be acceptable in each case, taking into consideration the special situation, conditions and interests of each country." The minority presented a report stating that the committee had been unanimous in advising the Conference to reject the idea of a customs union.

The report on the project of a railroad down the back-bone of the hemisphere is the only one adopted without amendment. The first proposition is that a " railroad connecting all or a majority of the nations represented will contribute greatly to the development of the moral relations and material interests of said nations." The second : " That the best means adapted to begin and carry out its execution is the appointment of an international commission of engineers to study the possible routes, determine their true length, estimate their respective cost, and compare their reciprocal advantages." Other propositions follow relating to the composition of the commission, routes, use of existing railways, proposals for and expense of surveys and construction, subsidies, cessions of lands, or guarantees. Of course this railway along the Cordilleras and Andes would develop the Latin Americans more than anything that has been devised. But it would extend our trade relations, increasing the market for our goods and bringing to us the products of far away democracies—the guano of Peru, the gutta percha of the Amazon, the coffee of Maracaibo and innumerable articles from every country south of the Gulf.

The committee on Communication on the Atlantic recommend the establishment of subsidized fast bi-monthly passenger, mail and freight steamer service between the United States and Rio de Janeiro, Montevideo and Buenos Aires; also an auxiliary bi-monthly freight line. The contracting governments to contribute to the fast lines in the following proportions: The United States 60 per cent.; the Argentine Republic, $17\frac{1}{2}$ per cent.; Brazil, $17\frac{1}{2}$ per cent.; Uruguay, 5 per cent.

Contracts for the service to be solicited by advertisements in papers in each contracting country and in awards due consideration to be given to existing contracts with Brazilian lines. In consideration of the higher aid to be paid by the United States, the contracting parties are to accept only vessels constructed in this country. The committee also recommends the encouragement of direct cable lines to connect the countries interested, with a good telegraphic service at equitable rates.

On the subject of patents and trade-marks the committee finds in the three treaties on copyright, trade-marks and patents subscribed to by the representatives of the seven South-American republics, who attended the recent congress of Private International Law at Montevideo, the principles which, in its opinion, should be adopted throughout this continent. In the treaties referred to, literary and artistic works, trade-marks and patents of invention are clearly defined; in the same manner are prescribed the rights of authors and artists, proprietors of trade-marks and inventions, which the contracting parties guarantee and protect; the formalities to be observed in obtaining this protection and guarantee; the limits of said rights, and the manner in which they may be exercised. In respect to literary and artistic copyrights it is provided that authors and artists shall enjoy the rights accorded them by the law of the State in which the original publication or production of their works took place; but that no State is obliged to recognize such rights for a longer time than that allowed to authors who obtain the same right in that State. Rights to trade-marks granted in one country are recognized in the others, but with due regard to their own laws; and

to enjoy the right to an invention for which a patent has been obtained in any one of them, it is necessary to have the patent registered in any other in which its recognition is asked for in the form prescribed by its laws. With regard to the duration of patents the same principle is established which was previously mentioned in relation to literary and artistic copyrights, and it is moreover provided that the duration of the patent may be limited in each State to the period prescribed by the laws of the State in which the patent was first granted, if such period be the shorter. It is also provided that questions arising on the priority of inventions shall be settled according to the date of the application for the respective patents in the country where they were granted.

The report of the Committee on International Law, as adopted by the Conference, says: That the formulation of a code of private international law on civil and commercial matters would require more time and attention than can now be given to it. Its discussion would be a work of many months, and this, too, without any certainty that the end aimed at would be brought about, because, owing to the complexity of the subject, and to the number and closeness of its relations to the internal legislation of each country, it would not be easy to reach off-hand an accurate conception of what the common interests demand. Fortunately the committee has found ready at hand as distinguished and complete a presentation of the subject as could be desired. That presentation is embodied in the treaties of civil and commercial law sanctioned by the South American Congress of private international law at Montevideo in 1888-89. The amplitude of the discussions had in that Congress,

the minute and careful study of every point and detail involved, the intelligent consultation and laborious study, which the reports and discussions show to have been bestowed upon the works of the most distinguished European and American writers, the just appreciation with which it has met, and, above all, the circumstance that it has already secured the adhesion of seven of the American nations, have powerfully influenced the committee in favor of embodying the work in question as the substance of what is to be recommended. The committee therefore submitted and the Conference adopted the following resolution: *Resolved*, That the governments represented in this Conference which as yet have not adhered to the treaties of private international law, civil law, commercial law, and law of proceedings adopted at the Congress which met at Montevideo on the 25th of August, 1888, be and they are hereby recommended to cause said treaties to be studied so as to render themselves able, within the year to be counted from the date of the termination of the labors of this Conference, to declare whether they do or do not adhere to the said treaties, and whether their adhesion to the same is absolute or qualified by some amendments or restrictions.

The sanitary measures recommended are those adopted by the Sanitary Congress of Rio de Janeiro in 1887 or the Congress of Lima in 1889.

The committees on postal and cable communication, on port dues, extradition, and banking have prepared reports which have not yet been conclusively acted upon.

It is one of the noblest outcomes of the Conference, and its best claim to remembrance by after times that it

seems to have provided a plan of arbitration between the nations of the hemisphere which will aid in putting a stop to the numerous costly wars between neighboring republics.

BULLETINS OF COAST AND GEODETIC SURVEY.—Mr. Charles A. Schott, assistant, etc., U. S. Coast Survey, has prepared tables* of the approximate times of culmination and elongation of the Pole-star and of its azimuth at elongation at any time between the years 1889 and 1910 for any place within the United States between latitudes 25° and 50° north. These tables are designed for the use of the surveyor, to facilitate the determination of a meridian line and of the magnetic declination (variation of compass) by simple instrumental means and by a method easy of application.

Two other Bulletins are announced, but not yet published, viz.: No. 16—Description of two new transit instruments for longitude; constructed at the office of the Survey from designs by Edwin Smith, assistant. No. 17—The relation between the metric standards of length of the U. S. Coast and Geodetic Survey and the U. S. Lake Survey. By C. A. Schott and O. H. Tittman, assistants, etc.

Professor Mendenhall, Superintendent, has under consideration a re-determination of trans-Atlantic longitudes, making use of the new Mackay-Bennett cables.

WEIGHTS AND MEASURES.—*Tables for converting customary and metric weights and measures* is the title of a handy publication issued by the Coast Survey. It covers linear, square and cubic measures, and those of capacity and weight. One table converts customary

* Bulletin No. 14, U. S. C. and G. S.

measures into metric, and the other reverses this order. It contains also such units as the chain, square mile, fathom, nautical mile, the English gallon and bushel, etc. The tables are arranged so that any unit from 1 to 9 can be converted by inspection into metric or customary measures. Foot notes give considerable data relating to the standards of measurements in the United States.

The Verification of weights and measures is the subject of Bulletin No. 15 of the U. S. Coast and Geodetic Survey. The paper is written by Mr. O. H. Tittman, assistant, etc., and is intended to convey information to those who wish to have their length measures verified, or who desire a comparison of their weights and capacity measures. The paper is prefaced by a brief account of the circumstances which attended the construction of the National prototypes of the metre and kilogramme.

MAGNETIC CHARTS.—The United States Coast and Geodetic Survey has recently issued four magnetic charts, viz., (1) chart of annual change of the magnetic declination for the epoch January, 1890. (2) Isogonic chart of the United States for the epoch 1890. (3) Isogonic chart of Alaska and adjacent regions for the epoch 1890. (4) Chart of the magnetic meridians of the United States, for January, 1890, and the present annual change of the declination.

These charts will form part of the illustrations for the Annual Report of the Survey for 1887-88* and 1888-89. The first will accompany the 7th edition of an article entitled "Secular variations of the magnetic declin-

* Now passing through the press.

ation in the United States," etc. Since the last publication of this valuable paper in the Report of 1886, its contents have been enriched by the addition of 174 observations made at 15 (new) stations, and the tabular results have been brought up to date with predictions of the variation of the compass, at 109 principal places, extending to the year 1900. On this chart we find also delineated the positions of the line of no variation, the so-called *agonic* line, for the epoch 1797-1803, when at its extreme north-eastern position, for the epochs 1850, 1875 and 1890, thus exhibiting the progressive long period change in the direction of the needle. Two shaded lines or regions, one passing over Nova Scotia, the other skirting our Pacific Coast, indicate the positions where at the present time the needle is stationary and about to reverse the direction of its motion.

The second and third charts, as well as the fourth chart will accompany the second edition of the article "Distribution of the magnetic declination in the United States for the epoch 1890." The large number of observations collected from all sources, together with the Survey's own work since the appearance of the first edition in the Report for 1882, and in particular the late advance made in our knowledge of the secular change, called for an early issue of these charts for which the office has great demand. The larger of the two charts brings out in much detail the local deviations from the regular distribution of magnetism, and is of special interest to the surveyor; the smaller one will be appreciated by the navigator. To give an idea of the richness of the material, it may be stated that this edition embraces 900 new stations, and gives the declination, ob-

served and reduced to epoch, for nearly 3,237 places, of which 652 are beyond and near our boundary. It is by means of these charts and from the extensive tables by the aid of which they had been constructed, that the Survey supplies on its maps and charts for the time of publication, the declination or the variation of the compass, together with the annual change to be applied in order that the information may be brought up to any later date.

The last of the four charts mentioned is supposed to be the first one of its kind especially constructed for the area of the United States. It also presents certain selected curves of equal dip of the magnetic needle and of equal intensity of the horizontal component of the magnetic force. This last element has of late years come into demand in connection with the rapid development of applied electricity. The magnetic meridians exhibit directly the direction of the horizontal part of the magnetic force; in other words they give the direction of the pointing of a compass needle at any position of the line. These curves thus represent a physical fact and are of theoretical interest, whereas, the isogonic curves, from which they were directly derived, are wholly artificial, but specially fitted for practical use.

These charts are handsomely got up, and much of their clearness is due to printing in two colors, the body or topographical part being in a light blue, and the magnetic part of the information in black.

SIGNAL OFFICE.—The Chief Signal Officer has adopted a signal known as the "Information Signal," and forming one of the system of "Storm, cautionary and wind-direction signals." It consists of a yellow pennant of

the same dimensions as the red and white pennants (wind-direction signals), and, when displayed, indicates that the local observer has received information from the central office of a storm covering a limited area; dangerous only for vessels about to sail for certain ports. The signal will serve as a notification to shipmasters that the necessary information will be given upon application to the local observer. Also, the signal at night for indicating westerly winds is now a *white* light above a *red* light.

The Weather Code used for enciphering the telegraphic weather reports has been revised and is now thoroughly satisfactory. It is more economical by forty per centum than any code ever used, and it is so arranged that after learning the key the cipher can be translated at sight and with greater speed than has ever before been possible.

A paper entitled "*Preparatory studies for deductive methods in storm and weather predictions*," by Professor Cleveland Abbe, is a popular and non-mathematical exposition of the laws of storms, with a view to their better prediction, and, in connection with a study of their diurnal variations, to constitute a deductive method of storm predictions. Professor Abbe, who is the assistant of the longest experience in the Signal Service, brings together in this memoir many new results, together with principles and conclusions formulated by him since the publication in 1859 of the memoir by Ferrel, which is recognized as the beginning of modern dynamic meteorology. The paper appears as Appendix No. 15 to the Annual Report of the Chief Signal Officer for 1889. Appendix No. 25 of this Report contains a list

of errata furnished by Prof. William Ferrel, and supplementary to his paper, *Recent Advances in Meteorology*, published in 1885.

HARBOR IN GULF OF MEXICO.—The Board of Army Engineers, appointed to make an examination of the north-west coast of the Gulf of Mexico, west of $93^{\circ}, 30'$ W. longitude, and to report as to the most eligible point or points for an harbor to be of ample depth, width and capacity to accommodate the largest ocean-going vessels, and the commercial and naval necessities of the country, report, after an application of such severe tests, that Galveston harbor is the only one which may be made to fulfil all the requirements of the Act of Congress; but commend, nevertheless, the harbors at Sabine and Aransas passes as being worthy of great consideration and of vigorous prosecution of the works of improvement.

COLUMBIA RIVER.—Major W. A. Jones, U. S. A., supplies some geographical details of an undeveloped but remarkably fertile portion of the Northwest, in a recent "Report of the examination of the upper Columbia River." He says: "The Columbia River crosses the international boundary $26\frac{1}{2}$ miles west of the boundary between Washington and Idaho Territory, and after flowing through mountainous country for a distance of 106 miles in a direction a little west of south, it enters the great plain supposed to have been occupied by an inland sea for a long period subsequent to the lava flows, which cut off the main drainage through the Cascade Mountains. Immediately upon entering this basin it trends directly to the west along the northern border of the great plain for a distance of

105 miles, when it strikes the foot of the hills of the Cascade Mountains and is turned to the south along the western confines of that plain. This is one of the two big bends of the Columbia River, and that portion of the great plain enclosed between its two arms is widely known as the Big Bend country. It is remarkable for its fertility, and requires no irrigation, but is absolutely destitute of springs of running water. There is little doubt, however, that water will be found abundantly by boring through the rock strata. Through this country the river is very new, geologically, and flows in long reaches at a level of several hundred feet below that of the plateau it incloses. It is still rapidly carving its way through the unstable lavas and basalts which generally form its bed. But the places where the waterway has not yet been cut out sufficiently to allow the river to pass through freely are very numerous. These are the places where navigation is obstructed by rocks and rapids.

YUKON RIVER.*—In previous letters to the BULLETIN mention has been made of the preliminary survey of the frontier line between Alaska and British Columbia along the 141st meridian of west longitude, at or near where it crosses the Yukon River. It will be remembered that the Superintendent of the Coast Survey, early in the summer of 1889, organized two parties at the instance of the Department of State, with Capt. J. E. McGrath and Mr. J. H. Turner, officers of the Survey, in charge, to establish points on the Yukon and Porcupine rivers. As these parties did not altogether succeed in reaching their destination before the close

* See map at the end of Bulletin.

of the season, no reports other than those of the itinerary have been received.

Through the courtesy of the Superintendent, the Director of the United States Geological Survey was invited to send a representative with the surveying parties for the purpose of making geological observations in Alaska. Mr. Israel C. Russell, geologist of the survey, was assigned to that duty, and his "Notes on the Surface Geology of Alaska"** present the earliest scientific intelligence of that interesting expedition.

A glance at the contents of this paper reveals a wealth of information skilfully presented. The time spent in Alaska by Mr. Russell was about three months, during which he travelled about two thousand five hundred miles. He entered the country from the west coast *via* St. Michaels, and left it from the south-western coast *via* Lynn canal and Juneau. After reaching Fort Yukon he proceeded up the Porcupine River, but afterwards returned to Fort Yukon and continued the ascent of the Yukon to the mouth of the Pelly River. He journeyed in an open boat up the Yukon to the mouth of the Lewes, ascended that stream, passing through lakes Labarge, Tagish, Nares and Bennett to Lake Lindeman, crossed the Chilkoot pass on foot and reached the head of Taiya inlet, the extreme northern reach of Lynn canal.

The interior of Alaska, that is to say, the vast territory lying to the south of the Yukon River, while it is known to be of value on account of its deposits of gold, copper and coal, is practically as unexplored as the "dark

* Bulletin of the Geological Society of America, vol. 1, pp. 99-162, March 13, 1890.

continent." The two great enterprises which Mr. Russell thinks would greatly assist its settlement are (1) a survey of the Yukon delta, which would determine whether there is a channel by which ocean-going vessels can enter the river; and (2) a survey of the passes between the head waters of the Yukon and the coast. This would furnish the needful data for making trails and wagon roads from the sea-shore to the head waters of the great river system of the interior. There are four passes more or less practicable for this purpose, none of which have been surveyed. Mr. Russell is of opinion that the Taku pass, though not the shortest, is the most practicable.

The part of the paper which will most interest geographers is the author's proposed change in the nomenclature of the Yukon River. In writing about this river and its tributaries an unfortunate confusion in names is met. The early voyagers entered the country from the West and from the East, and ignoring aboriginal names applied different ones to the same head waters. When the connection of these fragmentary explorations was established a confusion in nomenclature resulted.

On the latest edition of the U. S. Coast Survey map the name Yukon is applied to the stream which flows from Lake Lindeman, or Crater Lake, and after passing through lakes Bennett, Tako, Marsh and Labarge is joined by the Pelly, Stewart and Porcupine rivers. Dr. G. M. Dawson, the eminent Canadian authority, claims* that the extension of the name Yukon so as to include the stream flowing from Crater Lake does vio-

* Report on an exploration in the Yukon district, 1887.

lence to the nomenclature proposed by early explorers, and, moreover, does not conform to the geography of the region. Dr. Dawson and Mr. Russell agree that Crater Lake is not the main source of the Yukon, but one of its secondary branches. On Dr. Dawson's map, in the report already referred to, what is known as the Yukon on the U. S. Coast Survey map is divided into three portions. From the sea to the mouth of the Porcupine River the name Yukon is retained; from the mouth of the Porcupine to the mouth of the Upper Pelly it is called Pelly; thence to Tagish Lake it is called the Lewes. The main source of the Lewes is considered to be the stream which enters the Tako arm of Tagish Lake.

"To one ascending the Yukon from the sea," Mr. Russell says, "it is evident that no change of name should logically occur where the main stream is joined by the Porcupine, as there is no perceptible change in its character at that locality. The same is true when the mouths of Stewart River and Pelly River are reached." About 150 miles above the mouth of the Pelly, the mouth of the Tes-lin-too (or, "Hootalinkwa" of miners, or, "Newberry" of Schwatka) is reached. *This* stream, Mr. Russell thinks, is the continuation of the Yukon and should share its name. "It flows," he says, "through a continuation of the same orographic valley that is occupied by the Yukon (or 'Lewes') below its mouth, while the Yukon (of the Coast Survey map) or the Lewes (of Dawson's map) above the junction is but a tributary stream, coursing through a narrow and poorly defined valley nearly at right angles to the main line of drainage. It seems evident to me," he contin-

ues, "that no unprejudiced observer could examine the junction without concluding that the Tes-lin-too should be regarded the main drainage channel." Accordingly he adopts in the "Notes" the name "Yukon" for the river from the mouth to its source, the source being "in the as yet unexplored region draining into Lake Teslin." The name "Lewes" he retains "for the stream on which Lake Labarge and the numerous lakes higher up the same system are situated."

Dr. Dawson, while admitting that the Tes-lin-too occupies the main orographic valley above its confluence with the Lewes, considers, for reasons stated in his report, the main source of the Yukon to be the Lewes, and the source of the Lewes at the headwaters of the Hotalinqu River.

CRUISE OF THE "THETIS."—Commander Charles N. Stockton recently gave to the National Geographic Society an account of the cruise of the *Thetis* in Arctic waters during the summer of 1889. This cruise was remarkable in several respects. The *Thetis* reached Mackenzie Bay in British North America, being the first Government vessel to carry the American flag in those waters. She also made the long stretch from Mackenzie Bay to Herald Island and Wrangell Land in one season, never before done, and she was the first vessel of any kind to follow the entire main coast line of Alaska from Fort Tongas in extreme south-eastern Alaska, to Demarcation Point in the Arctic Ocean.

The steamer left San Francisco, April 20th, and reached that port again December 8th, 1889. St. Matthew Island was visited with a view of ascertaining whether there were any shipwrecked persons there, and

to verify the statements made upon the charts that it was infested with polar bears. Old traces of these animals were found in abundance, but no evidences of their present existence. "This island," said Captain Stockton, "is probably the southern limit of the solid ice in winter in that part of Bering Sea." The Siberian coast was next touched by the expedition in an effort to gather news concerning the fate of the whaling vessel *Little Ohio*, which has been missing since the previous autumn. Finding no traces the *Thetis* passed through Bering straits to the Arctic Ocean. At the native village of Point Hope, two whalers were met with and the information obtained that the *Little Ohio* had been wrecked at this point and that the survivors were at the village. These men were taken on board. Cape Sabine was reached July 27th. Near by was a coal mine where the *Thetis* had coaled the summer before and this mine was still being worked by the natives. In the vicinity also was a stream called by the natives the Pitswagea, and known to but few whites, and not set down on any chart or map. The river is very winding, its general course being north-west. Its length is estimated to be over one hundred miles. A remarkable ice cliff was found on this river about twenty-five miles from the mouth. The glacier faces southward, and gales have deposited particles of soil and débris of plant along with the seeds upon the surface of the ice to a depth of from four inches to a foot. In the summer the vegetation is warmed to life in a remarkably short time, and the brown coat left by the receding snow is almost miraculously transformed to a robe of green, studded here and there with bright polar flowers. The river is gradually cutting into the

glacier. During the summer the ice melts away, leaving the protecting soil above like the eaves of a house. When it protrudes too far for the strength of the grass roots, it topples over into the river. At the freezing in September icicles form from the overhanging sod to the river ice below, making a narrow portico four miles in extent.

Captain Stockton gave an account of the building of the house of refuge at Point Barrow and of the assembling of the entire fleet of whaling and United States vessels at this point. Forty-seven vessels carrying the American flag and manned by about 1,200 men, had gathered within sight of the most northerly point of the United States. The *Thetis* got caught in the ice a short distance east of Point Barrow and was forced to remain there for five days.

The best landmark found both in Bering Sea and in coming from the Pacific was Akutan Island and volcano. The top of this volcano, which is at times active, is generally obscured by clouds, mist and smoke; but this in itself, in connection with the strongly outlined sides of the island and lower part of the volcano, presents features that would not escape notice in any but thick weather. Port Clarence is the best harbor before reaching the Arctic, where no harbors exist west of Herschel Island. It is now used as a rendezvous for a large portion of the Arctic whaling fleet. Seven steam whalers, sailing whalers, one trading vessel and a bark were found here by the *Thetis* on the 11th of July, 1889. There is no native settlement of any size in the bay, but natives assemble here from the surrounding country and islands for trade with the whale ships. On the Siberian coast of Bering Sea, Indian point (otherwise known as Cape

Tchaplin) which is quite a rendezvous for vessels, is a long, low point of shingle and sand, extending several miles to the eastward from the mainland with bold water upon both sides. The native village is a large and prosperous one with a population of about 350. They seem to be Eskimo and closely allied to the natives upon the Alaskan side. They seem intelligent, bright traders, good whalers, and generally more prosperous than the Alaskans.

As a collateral to Washington notes on Alaska it may be mentioned that an expedition is being organized by prominent publishing companies in New York to penetrate the vast tract of unexplored country lying between the Copper and Yukon rivers in central Alaska. Considerable care is being given to the proper composition of the party. The officers of the United States Coast Survey are interested in the plans for the explorations and will give all possible assistance. The necessary scientific instruments will be provided by Professor Mendenhall, who will also provide transportation for the party on the Government steamer *Patterson* as far as Chilkat.

THE GULF STREAM.—Lieut. J. E. Pillsbury of the Navy has, at the request of Prof. T. C. Mendenhall, Superintendent of the Coast Survey, written him a letter setting forth his views on the subject of the Gulf Stream and its variations. He says:

“I think the Gulf Stream does change its position to a slight amount, but not in the arbitrary manner or to the extent stated by some of the newspaper writers of late. . . . While it is probably a fact that, as a rule, a current from the Equator is warm, and one from the

Pole is colder than the surrounding waters, it is not always the fact that the warmest flowing water is from the south, nor that the coldest is from the north. . . . The mere presence of warm water does not necessarily show that a current exists, nor does a change in temperature show that there is a change in current.

. . . The Gulf Stream probably has a vibratory motion, as evidenced by our anchorages at No. 1 station off Hatteras and as previously noticed off Rebecca Shoal, Fla. Anchored there, on the northern edge of the stream, riding to the wind with a gentle current, the latter would suddenly become strong and swing the vessel until she was stern to the wind, to remain but a short time, and then the current becoming weaker the wind would gain the ascendancy. This was repeated a number of times. I believe that the daily volume of the stream varies but little except from that due to declination of the moon. Along the northern coast, however, it is not always on the surface, but is, from an unknown cause, overrun by other currents. I think that its track through the ocean is absolutely fixed by law, and that its vibration is periodic, although the limit of the periodic change may vary to a trifling amount. The generally accepted belief that a wind blowing across the current changes the position of its axis is, I am convinced, erroneous. Every temporary wind, however, does transport water (chiefly by means of waves) and with it goes its heat or cold. The fact of finding gulf-weed within a few miles of Nantucket light-ship does not so much prove that the current is nearer our shores as it does that winds have prevailed in the direction from which it comes. Its home is in the

Sargasso Sea, from which it is drawn by the winds and sea. A small amount finds its way into the Caribbean Sea through the Antigua Passage, but most of it passes north of the West Indian Islands. The break of the waves has more effect on its movements than a current, unless the latter is very strong, and in the Gulf Stream itself it is seen stretching in long lines in the direction of the wind and sea, and not in the direction of the current, except only in the case of a rip at the meeting of the currents. Anchored on the edge of Florida Reefs with a strong wind blowing directly from the Gulf Stream, which was only a short distance away, its clear blue water was driven by the sea and overcame the cloudy reef-water, but no current accompanied it. In Key West harbor the water is usually cloudy. A southerly wind will cause a sea that will carry the clear water inshore, even in spite of an ebb-tide. The wind shifting to the opposite quarter will at once alter it to milky whiteness."

COLON.—The collapse of Colon since the suspension of work on the Panama canal seems to be complete. Vessels are scarcely seen in the harbor, where a few months before they were obliged to anchor for days waiting for dock room. The consul at Colon says that forty towns had sprung up on the line of the canal in almost as many miles, and that the local traffic on the isthmus reached vast proportions. These towns were populated with energetic people from all nationalities. Wages were high and labor incessant, day and night. This local business on the line of the canal has vanished, and the rank vegetation of the tropics is hiding dredges, railroad trains and contractors' paraphernalia

which had been left on the line as if work were to be resumed on the morrow. Rents have fallen off five hundred per cent. and nearly two-thirds of the business houses in Colon are closed up. Transit traffic has not suffered.

Congress provided in 1889 for "the repatriation of Americans who became destitute because of the collapse of the Panama canal." All who have applied for relief have been returned, mostly to New York.

BARRANQUILLA.—Mr. S. M. Whelpley, vice consul of the United States at Barranquilla, makes a strong claim for the commercial superiority of that city as against Cartagena, the capital of Colombia. The fame of the latter, he says, is largely due to its antiquity ; and centuries of decay are plainly visible in the ancient buildings, walls and crumbling fortifications. Barranquilla is to the Magdalena River and its tributaries as New Orleans is to the Mississippi, the terminus and home port of all the largest class of river steamers, the chief port for entry and shipment, her merchants controlling, through their correspondents in the interior and abroad, at least three-fourths of the imports and exports from the interior States bordering the Magdalena and the Cauca rivers.

TALZERES ISLAND.—Talzeres Island, at the entrance of the Oronoco River, has been formed since the last survey of that river, and is not indicated on the charts. Situated eastward of the S. E. extremity of Cangrejo Island, it is about one and one-half miles in length in east and west direction, and covered with trees about twenty feet high. New islands are forming to the

northward and eastward of this one.—*U. S. Hy. Office, Notice to Mariners.*

PARAGUAY.—The recent land speculation in Paraguay has abated, and there is evident progress on the basis of real values. Roads are being improved, and bridges multiplied. The effort to diffuse popular education has not declined, the number of schools and attendance having greatly increased. Large amounts have been spent in the repairs of churches. Municipal improvements in Asuncion, such as pavements, new tramway lines, and electric lights are especially noticeable. Besides the five banks already existing, a new one has been created with a capital of eight million dollars, paper. It is authorized to issue notes to three times the amount of its paid-up capital, and besides its banking business will have a special section for encouraging colonization. Although the increase in immigration has been quite marked, much larger results are looked for. The Government has appropriated, to advance this object, four times the amount provided in 1888. The want of a direct communication with Europe is a serious obstacle in the way of the Government efforts to attract immigrants, and it is stated, moreover, that many who have this destination in view are met in Buenos Aires by agents of the Argentine immigration office, and induced to remain in the Argentine Republic. Several Americans who are now in Virginia are expected soon, accompanied by practical tobacco and cotton farmers with the best machinery. A land company has given land on certain conditions, and an effort will be made to make the venture successful.

Two new stations have been opened on the prolongation of the railway from Paraguari to Villa Rica, and the

entire line to Villa Rica is about completed. In March last the existing railway and the right to extend to Villa Encarnacion passed into the hands of London parties, and the stock of the company was subscribed for three times over. Plans have also been approved for the proposed line to connect Asuncion with Sucre, Bolivia, and it is reported that a company proposes to put on the river a special fast service of boats which will make the trip from Buenos Aires to Asuncion in three and a half or four days, instead of six or seven as at present.

SAMOA.—Commander Hunker, of the U. S. S. *Adams*, stationed at Apia, informs the Navy Department under date of December 30, 1889, that the affairs of the Samoan people seem to have been amicably settled, and that a large party of the most prominent of the opposition chiefs of Tamasese's party came to the official residence of Malietoa, and formally acknowledged their allegiance to Malietoa. The natives and foreign residents consider the peace of the country as assured, and the German authorities are so well convinced of this that they do not consider the presence of a war vessel now necessary at Samoa. The German cruiser intended to sail on the 20th of January for Auckland, New Zealand, to remain away until the end of the "hurricane season."

An account of the disaster at Apia, in the hurricane of March 15th and 16th, 1889, has recently been published by the Navy Department. The public is familiar with most of the details of this calamity, but the violence of the storm which sacrificed the lives of fifty-two brave seamen, and wrecked two steamships of the Navy is something that landsmen feebly appreciate.

Congress, by an act approved February 19, 1890,

made provision for the relief of the sufferers by these wrecks, by directing the payment to each survivor of a sum equal to the losses sustained by them, not to exceed the amount of twelve months' pay, and to the surviving families or dependents of those who were lost in the wrecks, or who have since died, a sum equal to twelve months' pay. Ten thousand dollars were also appropriated for the removal of the remains of deceased officers and seamen to the United States. The Navy Department presented the native chief Seumann, who assisted in rescuing the officers and crew of the *Trenton*, a double-banked whale-boat with fittings, and suitable rewards to the men composing his crew. And to Fugi Hachitaro, who saved the life of Lieut. J. C. Wilson of the *Vandalia*, the Treasury Department has awarded the gold medal of the Life-Saving Service.

IRON CHURCH IN MANILLA.—The Recoleta Brotherhood of the Catholic Church in Manilla, Philippine Islands, is constructing in the district of San Sebastian an earthquake-proof church. The entire frame-work is of wrought iron, bolted together in the firmest manner, the fluted columns and buttresses being hollow. The walls are of double plate iron with a space of thirty inches between the plates. The dimensions of the edifice are: length 162 ft., width 70 ft., height to the top of the arches 52 ft., and to the spring of the same 34 ft. Two towers are each 19 ft. square by 170 ft. high. The total weight of the iron in the building is 1,600 tons. The material was made in Brussels. Total cost, \$350,000. It is expected that this structure will defy the most vigorous earth-shaking.

SIAM.—A company has been incorporated to build at

once a railroad from Bangkok *via* the town of Paknam, at the mouth of the Menam, to Petriu, a distance of about thirty miles. It will be the first railroad in Siam and is to be built exclusively by Siamese capital. A corps of engineers is engaged in running a line northward towards Burma.

The city of Bangkok is to be lighted by electric lights. A company has been organized, and the plant is ordered and will be soon put in operation.

SCHWALBACH AND ZURICH.—It will interest Americans who resort to the baths of Schwalbach (or, Langenschwalbach as it is now officially called) for the treatment of nervous and other complaints, to know that this locality is now easy of access by reason of the opening of the new railway line from Wiesbaden.

The growth of Zurich as a tourist centre has been quite marked of late, the number of tourists registered during the season of 1889 being 123,587 as against 112,426 during the preceding year. The hotels at times were filled to overflowing. The French Exposition no doubt gave some impetus to this movement, but the large outlays made by the city in beautifying its lake-front, provisions for lake excursions, and special excursion trains to near points of interest and beauty, and the centring here of railway lines from Paris, Milan and Vienna, have had much to do with making Zurich one of the most popular and attractive resorts in Switzerland.

Among the great achievements of Swiss enterprise, during 1889, was the opening of the mountain railway leading to Mt. Pilatus, overlooking the Lake of Luzerne.

IRRIGATION.—The Government literature of irrigation has been increased by the publication in quarto form, of a translation of "Irrigation in Egypt," by J. Barois, Engineer-in-Chief *des Ponts et Chaussées*. The work contains general information concerning Egypt and the Nile, the method of irrigation and description of irrigation works in Egypt, the method of elevating and using irrigation water, the construction and repairs of canals, dikes, etc.

Although basins of submersion form the traditional system of Egyptian agriculture, the practice of irrigation on a vast scale is of very recent origin. For this reason the methods are not yet well planned, and there did not exist, up to the present, rules properly established and sanctioned by long usage for the employment of the water for irrigation, for the rotation of crops on irrigated lands, for the drainage of the soil, and generally for everything which pertains to agriculture.

The publication, which is accompanied by twenty-three plates, was translated by Major A. M. Miller, U. S. A., and was ordered printed by the House of Representatives on account of interest now attached to the subject in this country.

Not less than thirty "irrigation bills" have already been introduced in Congress at this session. The special committee of the Senate appointed at the last session to investigate during the recess the matter of reclaiming arid lands by means of irrigation has a very voluminous report in preparation which will soon be submitted.

It is perhaps a misfortune that the introduction of this great work of water storage in Arizona should have

been deferred by the recent disaster at Walnut Grove dam. "This dam," says Lieut. Glassford of the Signal Corps, "is in the central part of Arizona, not far from Prescott, being about 4,000 ft. above the sea level and with a drainage of 150 square miles. The average rainfall in the mountainous region of the territory is about fifteen inches a year, and the least amount, ten inches, is sufficient to always keep full a reservoir of this kind, and while the dam was built for mining purposes only, the great question of water storage has since been made of such importance that as a secondary means of utilizing the water it had been proposed, and steps were being taken, to build flumes and ditches to the level land suitable for agriculture lower down in the valley of the stream."

COMPRESSED AIR MOTORS.—Mr. J. L. Rathbone, United States Consul at Paris, has made a careful examination of the system of compressed air tramway motors and of the Mékarski system of compressed air applied to locomotives, and demonstrates at considerable length* the advantages of the systems as shown on roads near Paris. The report is technical, and accompanied by drawings. An engineer sent to Nantes to examine Mékarski's compressed air motor reported that "for economy, absolute safety, and ready management it is the best motor now known."

H.

* United States Consular Report, February, 1890.



SKETCH MAP OF
ROUTE TRAVELED BY I.C.RUS
Scale 1:10,360,000 = 167 mi



MAP OF ALASKA,
BY I.C. RUSSELL IN 1889 ----
0,000 = 157 miles : 1 inch



CASTLE-NICK—MILE-CASTLE, AND PART OF THE ROMAN WALL.